



The Art of MEASURING:
OR,
The Carpenters new Rule
Described and Explained.

Furnished with variety of *Scales*, fitted for the more speedy Mensuration of divers *Superficies* and *Solids*, with all necessary requisites appertaining thereunto, as a plain and easie Introduction to the Principals of *Geometry*, which is the Ground and Foundation to all kind of MENSURATION.

Together with the Description and Use of the *Logarithmical Tables* of *Proportion* in *Arithmetick* and *Geometry*; Also their particular Application in the *Measuring* of *Superficies* and *Solids*, as *Board*, and *Timber*, *Glass*, *Paviours*, *Wainscot*, *Plaistering*, *Brick-work*, *Tyling*, *Gaging*, &c.

Of singular Use for Work-men, Artificers, and other Ingenious persons, that delight therein.

Composed and Published by *W. Leybourne* Math.

Unto which is annexed a *Supplement*, containing the Description of the *Line of Numbers*, with its Use Explained and Illustrated in divers Practical Examples of *Mensuration*.

By *John Wilde*, Carpenter & Philomath.

London, Printed for *Richard Tonge*, at the Sign of the *Golden Lion* in *Little-Britain*. 1669.

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Together with the Description and Use of the Line of Proportion, of Proportion in Plain Triangles and Geometry, Also their Application to Mensuration in the Measuring of Timber, Glass, Paving, Tyling, Bricklayers and Plaisterers Work, as Board, and Timber, Glass, Paving, Tyling, Bricklayers and Plaisterers Work, as Board, Brick-work, Tyling, Glazing, &c.

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The Preface *to the* Reader.

GEOMETRY, or the Art of *Measuring*, being the Subject of this small Treatise, I presume needs not court thy candid acceptation, since it contains so much variety of plain familiar Precepts and Examples, all conducing to the full information of the most ordinary Capacities in these curious and delightful speculations.

Geometry stands not in need of any *Rhetorick* to commend it, or to make it appear with the greater Lustre to the eye of the World; for it carries its force of Demonstration along with it; the same

I may say of *Arithmetick* also, which is the only Hand-maid to *Geometry*; upon which Foundation all Sciences *Mathematical* have their principal dependence; and from those two Liberal Sciences alone, infinite rare Conclusions may be drawn. Hence then, of what great and general use, especially to Work-men and Artificers, a competent knowledge herein must needs be, I leave to any indifferent and unbyassed person to judge.

Now the drift and scope of this little Book, is, only to instruct those who desire to be acquainted with these ravishing Mysteries, and from hence such persons may be enabled to make a farther progress, and to proceed gradually,

till they are capacitated for deeper enterprizes; let not the plainness of the Garb therefore discourage you from a free and generous entertainment, since so many useful, plain, and practical Conclusions are taught herein. But now in order to the Readers satisfaction, I shall give a brief Account of the chief heads contained in this small Treatise. They are principally these. (1.) You are presented with divers *Geometrical* Definitions and Problems, as a convenient Harbinger to what follows. (2.) You have some brief easie ways laid down how to take Heights and Distances, by the help of no other Instrument than a *Two Foot Rule*, (an Carpenters daily Companion,) or in the absence thereof

a *Square*, and sometimes by both; which *Conclusions* often yield much delight to a Workman, as well as others. (2.) You are presented with the Description and use of a *Two Foot Rule*, with divers Scales placed thereon; after a new Method, by which you are instructed how to Measure several *Superficies* and *Solids*, illustrated by Examples, and contrived by that excellent *Mathematician* Mr. *Samuel Foster*, once Reader of *Gresham-College*; also, several *Arithmetical* Precepts briefly exemplified for Mensuration in Foot-Measure only. And lastly, You have a Description and Use of the *Logarithmical Table of Proportion*, (from whence is deduced that famous Line) known amongst Work-men by the name

of *Gunter's Line*) illustrated and explained; First, in *Arithmetick*; viz. *Multiplication*, *Division*, *Extracting of* Roots, and the *Rule of Proportion*. (2.) In Mensuration of Plain *Superficial Figures*, as the *Square*, *Triangle*, *Trapezia*, and *Irregular Figures*, &c. And upon the same Foundation, doth have their particular application in Measuring *Board*, *Glass*, *Pavement*, *Wainscot*, *Plaistering*, and *Tyling*, &c. Lastly, There is shewed also the Measuring of *Solids*, as *Stone*, *Timber*, *Cask*, and such like; unto which is subjoined, for variety sake, a *Supplement* to complete the work, containing the *Description of the Line of Numbers*, with its Use explained, and illustrated with divers familiar Examples in the Art

of

Mensuring; so that 'tis supposed there is nothing best wanting, which may be serviceable to the Artificer, either in the Theory or Practick part of *Mensuration*. All which is digested into this small Pocket Volume, and fitted to the understanding of mean capacities. Thus not doubting of your kind Acceptance, wishing you much pleasure in the perusal, and all happiness in your honest endeavours.

Vale.

Advertisement.

Whosoever hath occasion for the Rules herein described, or any other Mathematical Instruments *whatsoever, either in Brass or Wood, may be furnished by* Edward Fage, *living at the Sign of the* Sugar-Loaf *in* Hosier-Lane *near* Smithfield.

DEFINITIONS
And
PROBLEMS
GEOMETRICAL.

Necessary to be known by all *Artificers*, for their furtherance in the practice of their several *VOCATIONS*.

Prob. I.

How to divide a Line into two equal parts by a Perpendicular.

LEt A B be a Line given, to be divided into two equal parts in the point C, by the Perpendicular Line D E.



First, Open your Compasses to any distance greater than half the length of the given Line, then setting one foot in A, with the other foot describe the Arches of a Circle a a and b b, both above and below the given Line.

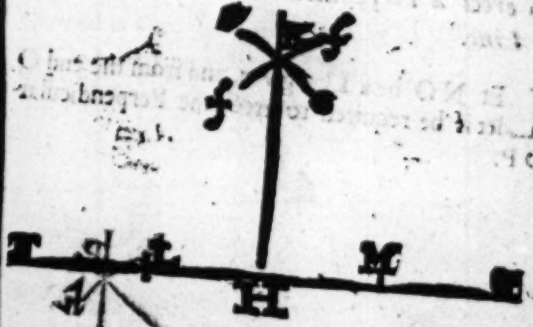
Secondly, Set one Foot of the Compasses in B, and with the other foot describe two other Arches of a Circle c c and d d, crossing the two former in the Points D and E.

Lastly, Draw a right Line from D to E, and it shall divide the given Line A B in two equal parts in the point C, and shall also be Perpendicular thereunto.

Prob. II.

How from any Point in a given right Line, to erect a Perpendicular.

LEt FG be a right Line given, and unto it (from the Point H,) let it be required to erect the Perpendicular H K.



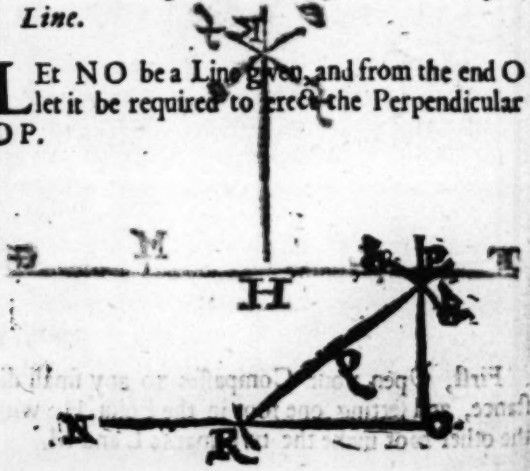
First, Open your Compasses to any small distance, and setting one foot in the Point H, with the other foot make the two marks L and M.

Secondly, Open the Compasses to any other distance, (greater than the former) and setting one foot in L, with the other describe the Arch e e; And removing the Compasses to M, describe the Arch f f, crossing the former in the point K.

Lastly, Draw the Line K H, which shall be Perpendicular to F G, and from the given point H.

Probl. III.

To erect a Perpendicular upon the end of a Line.



LEt N O be a Line given, and from the end O let it be required to erect the Perpendicular O P.

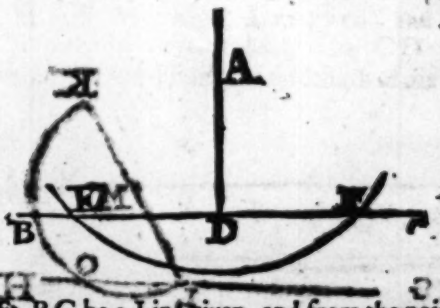
First,

First, Open your Compasses to any small distance, and setting one foot in O, pitch down the other foot at adventure, as at the Point Q; the Compass Point resting in Q, turn the other about till it cross the given Line in the point R, and the foot still resting in Q, with the other describe the Arch of a Circle h h over the given point O; And laying a Ruler from R to Q; it will cut the Arch h h in P.

Lastly, Draw the Line P O, which shall be Perpendicular to the given Line N O.

Probl. IV.

From a Point given, to let fall a Perpendicular upon a Line given.



LEt B C be a Line given, and from the point A, let it required to let fall the Perpendiclar A D.

First, Open your Compasses to any distance greater than the neareſt diſtance that can be taken between the point A, and the Line B C; And ſetting one foot of the Compaſſes in A, with the other deſcribe the Arch E F.

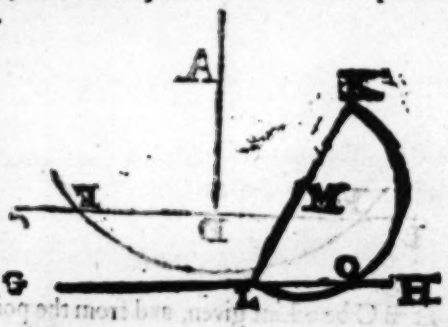
Secondly, (By the firſt Probl.) Divide the Line E F in two equal parts in the Point D.

Laſtly, Draw the Line A D, which ſhall be Perpendicular to B C, and from the given point A.

Probl. V.

How to let fall a Perpendicular from a Point given, which is juſt over (or near) the end of a right Line.

Let G H be a Line given, and from the Point K; let it be required to let fall a Perpendicular K O.



First,

First, From the Point K draw a right Line K L, croſſing the given Line G H, which Line divide into two equal parts in the point M; Then ſetting one foot of the Compaſſes in M, open the other to the Point K, and deſcribe the Semi-Circle K O L, cutting the given Line G H in the point O.

Laſtly, Draw the Line K O, which ſhall be Perpendicular to G H, and near to the end thereof.

Prob. VI.

A Right Line being given, how to draw another Right Line, which ſhall be Parallel thereunto, at any diſtance required.

Let A B be a Right Line given; and let it be required to draw another Line C D Parallel thereunto at the diſtance of the length of the Line E



First, Take in your Compasses the length of the Line E, and setting one foot of the Compasses in A, with the other describe the Arch of a Circle m m. Then remove the Compasses to B, and describe another Arch n n.

Lastly, Lay a Ruler to these two Arches m m, and n n, so that it may only touch the very tops of them, and draw the Line C D, which shall be Parallel to A B, and at the distance of the given Line E

Probl. VII.

To draw a Right Line Parallel to another Right Line, which shall pass through a point assigned.

Let F G be a Right Line given, to which let it be required to draw another Line K parallel thereunto, which shall pass directly through the given point K.

The first Variety.



The

The second Variety.



First, Take in your Compasses the distance from K to G, and setting one foot of your Compasses in F, with the other describe an obscure Arch of a Circle o o.

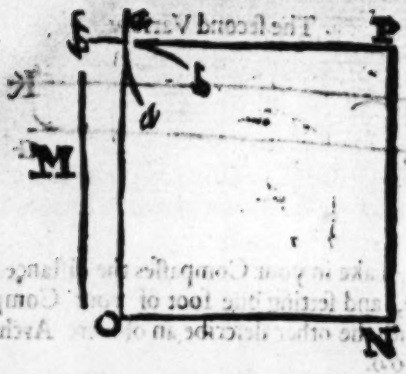
Secondly, (in the first Variety) Take in your Compasses the whole length of the Line F G, and setting one foot of that extent in K, with the other describe another obscure Arch q q, crossing the former in the point L. A Line drawn from K to L, shall be parallel to F G.

Prob. VIII.

How to make a Geometrical Square, whose sides shall be all equal to a Right Line given.

LEt M be a Line given, and let it be required to make the Geometrical Square N O P Q, whose sides (each of them) shall be equal to the given Line M.

First,



First, Draw the Line N O equal in length to the Line M, and upon the end thereof O (by the third Problem) erect the Perpendicular O P, equal in length also to the given Line M.

Again. Take the Line M in your Compasses, and setting one foot of them in P, with the other describe the Arch a a. Also set one foot in N, with the other describe the Arch b b, cutting the former Arch in the Point Q.
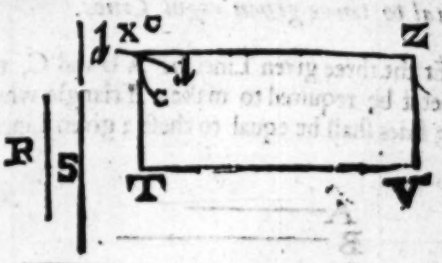
Lastly, Draw the Lines Q P, and Q N, so shall you have formed the Geometrical Square N O P Q.

PROBL. IX.

Prob. IX.

How to make a long Square or Parallelogram, whose sides shall be equal to any two Lines given.

LEt R and S be two Lines given, and let it be required to make the Parallelogram TVZX, whose two shorter sides shall be equal to the Line R, and whose longer sides shall be equal to the Line S.



First, Take in your Compasses the length of the longer Line S, and draw the Line TV equal thereunto, and upon V erect the Perpendicular VZ equal to the Line R. Secondly.

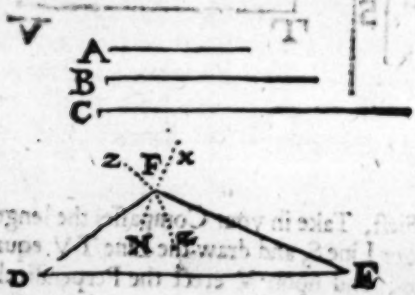
Secondly, Take the Line S in your Compasses, and setting one Foot in Z, describe the Arch *c c*; Also take in your Compasses the length of the Line R, and setting one Foot in T, with the other describe another Arch *d d*, crossing the former in the Point X.

Lastly, Draw the two Lines X and Z, and X T, so shall they include the Parallelogram T V Z X.

Probl. X.

How to make a Triangle, *whose 3 sides are equal to three given right Lines.*

Let the three given Lines be A B and C, and let it be required to make a Triangle whose 3 sides shall be equal to these 3 given Lines.



First,

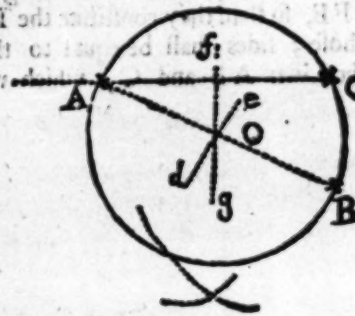
First, Take in your Compasses the longest of the given Lines, and draw a Line as D E equal in length thereto, Then Secondly, Take in your Compasses the length of the given Line B, and setting one Foot of the Compasses in E, with the other describe an obscure Arch of a Circle x x, Then Thirdly, Take in your Compasses the length of the given Line A, and setting one Foot of that extent in D, with the other describe another obscure Arch of a Circle z z, crossing the former Arch x x in the Point F. Lastly, Draw the two right Lines F D, and F E, so shall they constitute the Triangle D E F, whose 3 sides shall be equal to the three given right Lines A B and C, which was required.



PROBL. XI.

Probl. XI.

Having three Points given, how to draw a Circle that shall exactly pass through those Points, provided that all the three Points be not seated in a streight Line.



LEt the three given Points be A B and C, First, of the three Points make a Triangle by drawing the Lines A B, B C, and C A; Then by the first Problem, divide any two of the sides into two equal parts at right Angles, as in the Figure; the side of the Triangle A B is divided at right Angles into two equal parts by the Line *d e*, and the side

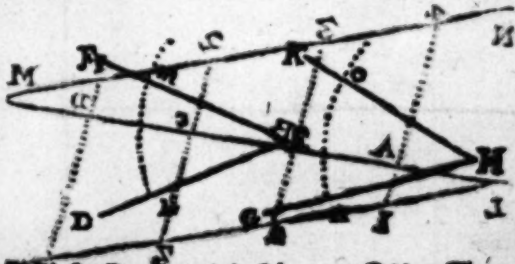
A C

A C of the Triangle is divided into two equal parts, and at right Angles by the Line f g. Now these two Lines d e and f g do cross each other in the Point O, so is O the Centre of a Circle, in which if you set one foot of your Compasses, and extend the other to any of the three given Points A B or C, the Circumference shall pass through the three Points which was required.

Prob. XII.

How to make an Angle equal to an Angle given.

LEt D E F be an Angle given, and let it be required to make another Angle G H K, equal thereunto.

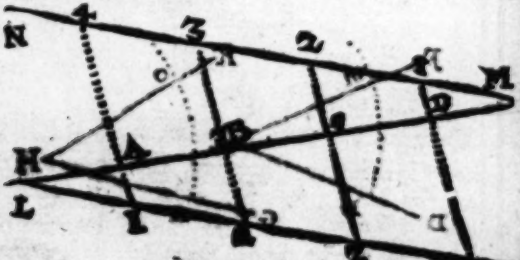


First, Draw a right Line, as G H. Then the Compasses being opened to any convenient distance,

stance, set one Foot in the given angular Point E, and describe an obscure Arch of a Circle as *l m*, which must cut both the sides of the Angle F E and D E. Secondly, The Compasses still remaining at the same distance, set one Foot in H, and with the other Foot describe an obscure Arch of a Circle *n o*, making *n o* equal to *l m*. Lastly, From H through the Point *o*, draw a right Line HK, making the Angle KHG equal to DEF as was required.

PROP. XIII.

How to divide a right Line given, into any number of equal parts.

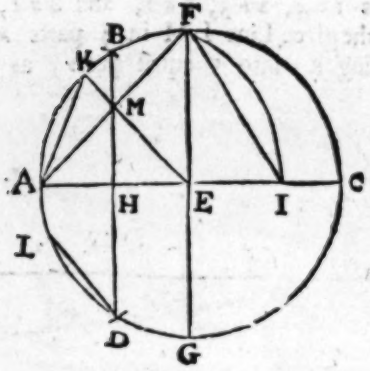


Let

LEt L M be a right Line given, to be divided into five equal parts. Firſt, From one end thereof, as from L, draw a right Line at pleaſure, as L O, making the Angle M L O. Secondly, From M draw another Line M N parallel to L O by the 7th Problem, or by the laſt Problem, make the Angle N M L equal to M L O. Thirdly, Open your Compaſſes to any ſmall diſtance, as M 1, or L 1, and with that diſtance run the Compaſſes along the Lines M N, and L O, four times (becauſe the Line is to be divided into 5 parts) at the Points 1, 2, 3 and 4. Laſtly, draw the Lines 1 *a* 4, 2 *b* 3, 3 *c* 2, and 4 *d* 1, which ſhall cut the given Line L M in 4 parts *a b c* and *d*, dividing it into 5 equal parts, as was required.

Probl. XIV.

A Circle being given, how to divide the ſame into any number of equal parts, not exceeding Ten; that is, how to inſcribe any Figure of 3,4,5,6,7,8,9,*or* 10 *Sides within any Circle.*



Let

LEt AFCG be a Circle given, and let it be required to find the ſide of a

Triangle	or Figure of	3	Sides that will be inſcribed within the ſame Circle.
Square		4	
Pentagon		5	
Hexagon		6	
Heptagon		7	
Octogon		8	
Nonagon		9	
Decagon		10	

Firſt, Through the Centre E draw the Line or Diameter of A E G dividing the Circle into two equal parts.

Secondly, Take in your Compaſſes half the Diameter A E or E C, and ſetting one foot in A, with the other make the marks B and D, and draw the Line B D, which ſhall be the ſide of a Triangle that will be inſcribed in that Circle.

Thirdly, Draw the Line F G through the Centre, cutting the Diameter A C at right Angles, and draw the Line A F, which ſhall be the ſide of a Square which will be inſcribed in that Triangle.

Fourthly, Set one Foot of the Compaſſes in H, and extend the other to F, drawing the Arch Line F I; then draw the right Line F I, which ſhall be the ſide of a Pentagon, which will be inſcribed within the Circle.

Fifthly, Any of the Semidiameters E A, E C, E F or E G are the ſides of a Hexagon or Figure of 6 ſides, that may be inſcribed in the Circle.

Sixthly, Half the Line B D, namely, H B, or H D are the ſides of a Heptagon, or ſeven ſided Figure, that will be inſcribed in that Circle.

Seventhly, Divide the Line A F into two equal parts in M, and draw the Line E M K, cutting the Circumference of the Circle in K, ſo ſhall a Line drawn from A to K, be the ſide of an Octagon, that may be inſcribed within the Circle.

Eighthly, Divide the part of the Circumference of the Circle D A B into three equal parts, one third part whereof is from D to L, ſo a Line drawn from D to L, ſhall be the ſide of a Nonagon or Figure of 9 ſides that may be inſcribed within this Circle.

Laſtly, The Line E I is the ſide of a Decagon, or Figure of 10 ſides that may be inſcribed in this Circle.

By this laſt Problem *you are taught how to find the ſide of any regular Figure that may be inſcribed within a Circle, not exceeding one of* 10 *ſides: I ſhall now proceed to ſuch* Problems *as concern the inſcribing and circumſcribing of Circles about ſuch regular Figures.*

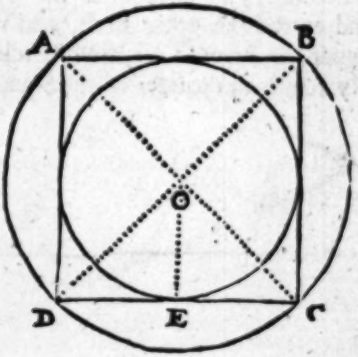
PROBL. XV.

Prob l. XV:

How to Circumscribe a Circle about a Square.

LEt A B C D be a Square given, about which let it be required to describe a Circle.

First, From either opposite Angle of the given Square, as from A to C, and from B to D, draw the two Diagonals B D and A C, crossing each other in the Point O.



Secondly, Set one foot of the Compaſſes in the Point O, and open the other to any of the Angles of the Square, as from O to A, with that diſtance deſcribe a Circle, and it ſhall touch all the four Angles A B C and D, which was deſired.

Probl. XVI.

To Inſcribe a Circle within a Square.

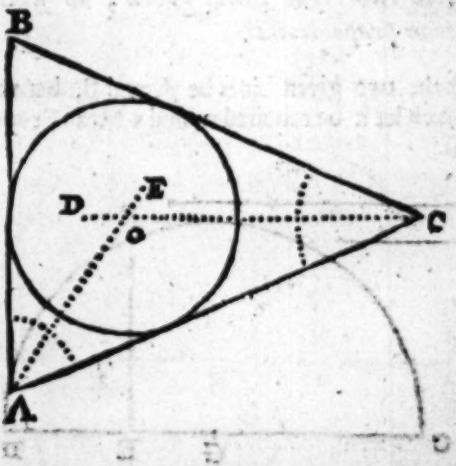
First, Draw the Diagonals A C and B D as in the laſt Problem; then from the Point O let fall a Perpendicular upon any of the ſides, as from O to E. Secondly, Set one foot of the Compaſſes in O, and extend the other to E, and with that diſtance upon the Point O deſcribe a Circle, which ſhall juſtly touch all the ſides of the Square.

Probl. XVIII.

Prob. XVIII.

To inſcribe a Circle within a Triangle.

LEt A B C be a Triangle given, within which let it be required to inſcribe the largeſt Circle that may be, which ſhall touch all the three ſides thereof.

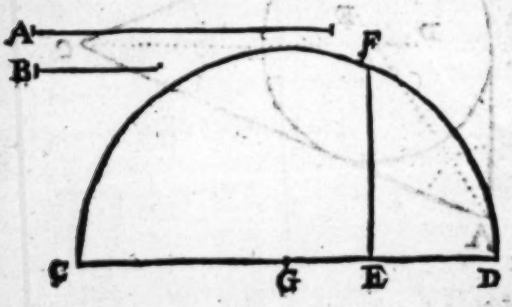


First, Divide any two of the Angles of the Triangle into two equal parts, as the Angles B C A and B A C, by the Lines C D and A E, cutting each other in the Point O, ſo ſhall O be a Centre, upon which if you deſcribe a Circle, it ſhall only juſt touch the three ſides of the Triangle, and ſhall be the largeſt Circle that can be inſcribed within the Triangle.

Probl. XIX.

Bewteen two right Lines given, to find a Mean proportional.

LEt the two given Lines be A and B, between which let it be required to find a Mean Proportional.

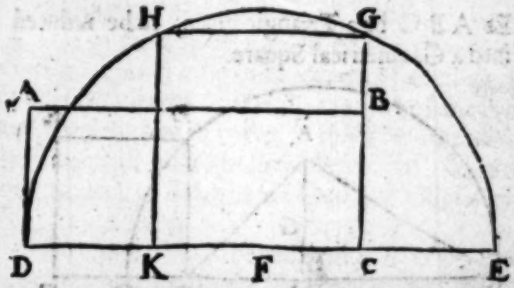


Let

Let the two Lines given A and B be joined together in one right Line, CD in the Point E, which Line C D divide into two equal parts in the Point G, upon which Point G, describe the Semicircle C F D, then upon the Point E, where the two Lines A and B were joined, erect a Perpendicular E F, which shall only touch the Semicircle in F, so shall the Line E F be a Mean Proportional between A and B, which was required.

Probl. XX.

To take a Geometrical Square which shall be equal in Area *to a long Square or* Parallelogram.



LEt the long Square A B C D be given to be reduced into a Geometrical Square retaining the same quantity. First,

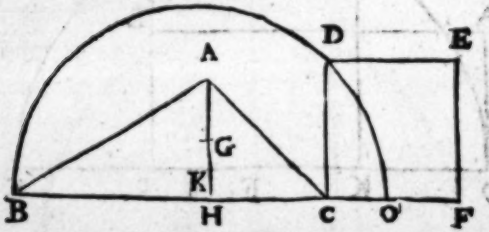
First, Continue the side D C of the long Square to E, making C E equal to C B the shorter side of the long Square.

Secondly, Divide the Line D E into two equal parts in F, upon which Point F, with the distance F D or F E describe the Semicircle D G E, and continue the side C B to G. so shall G C be the side of the Geometrical Square C H G K, which shall be equal in quantity to the long Square A B C D.

Probl. XXI.

How to make a Geometrical Square equal to a Triangle *given.*

LEt A B C be a Triangle given, to be reduced into a Geometrical Square.



Extend the side of the Triangle B C, to O, making C O equal to half the length of the Perpendicular

pendicular of the Triangle H G. Secondly, Divide the Line B O into two equal parts in K, and upon K at the distance K B describe the Semicircle B D O, and upon C erect the Perpendicular C D, to touch the Semicircle in D, so shall C D be the side of a Geometrical Square equal to the given Triangle A B C.

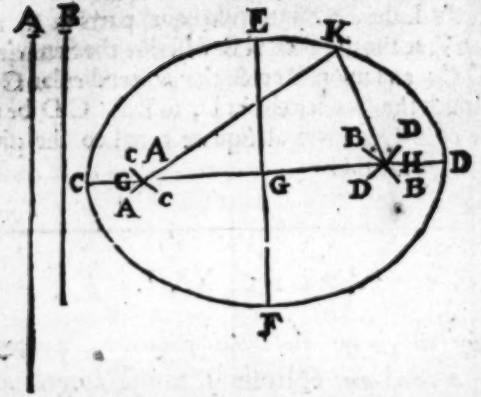
Probl. XXII.

How to draw an Oval Figure (properly termed an Ellipsis *) whose length and breadth) or rather whose two Diameters) are limited.*

THe manner of describing of an Oval according to the way prefixed in the foregoing Pro. is limited; for if it be to be drawn of any length, the breadth thereof will be always in the same proportion to the length; But in this it is otherwise, for it teacheth how (both the length and breadth being given) to describe an Oval (or Ellipsis rather) at one sweep;

Wherefore, Let it be required to describe such a Figure whose length shall be equal to the Line A, and whose breadth shall be equal to the Line B.

First,



First, Draw two Lines C D equal to the given Line A, and E F equal to the given Line B, croſſing each other at right Angles, and dividing each other into two equal parts in the Point G. Secondly, Take in your Compaſſes half the length of the longeſt Diameter C D, *viz.* G C or G D, and with that extent of the Compaſſes ſet one foot in E, and with the other croſs the longer Diameter with two obſcure Arches *c c* and *b b*; and with the ſame extent of the Compaſſes, ſetting one foot in F, croſs the two former obſcure Arches *c c* and *b b* with two other obſcure Arches *a a* and *d d*, croſſing the two former in the Points G and H.

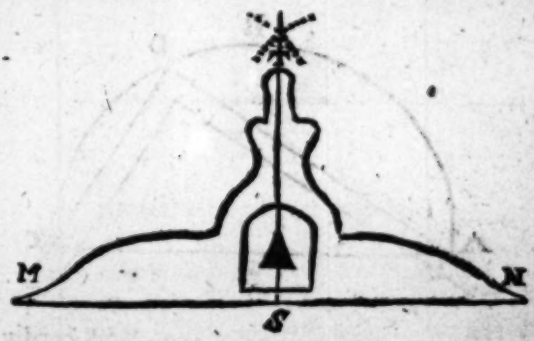
Thirdly, In the two Points G and H faſten two ſmall Pins, or ſmall Tacks, and putting a String about

about them, tie the ends thereof together at the length of the Line G D, ſo that the String may move about both the Pins G and H together, and being extended, will reach juſt to C, to E, to D, or F, and with a Tracer or Black-Lead-Pencil, being led about by the Hand, will deſcribe a perfect Ellipſis or Oval-like Figure, as may be plainly ſeen in the Diagram.

Probl. XXV.

How to make a Level, *which Artificers call a* Triangle *or* Plumb-Line, *if ſuch Tools as thoſe were loſt.*

THe Firſt and Second Problems in this caſe will help you; Wherefore in the following Fi-



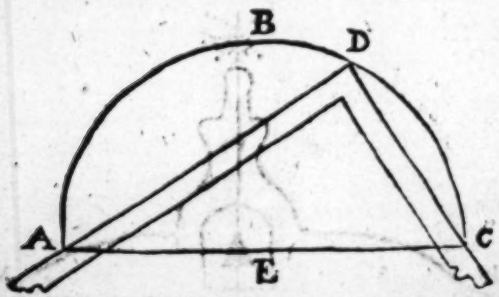
gure

gure having drawn the Line M N, about the middle whereof at S erect the Perpendicular S T, and thus by raising of a Perpendicular upon 2 Boards, or 1 fitted for this purpose, you may find your Level or Plumb-line, and so frame your Instrument for your use, if all other helps (as your Square, *&c.*) were wanting to make it by.

Probl. XXVI.

How to make a Square, *if another be wanting to make it by.*

First, Draw a right Line A C, which divide into two equal parts in the point E, and upon E as a Centre describe the Semicircle A B C.



Secondly,

Secondly, In any part of the Circumference thereof make a Point as D. From which Point two right Lines being drawn to A and C, they ſhall conſtitute a Square or right Angle at the Point D; and ſo two pieces of Wood ſo framed, ſhall be a true Square.

Theſe are ſuch Definitions and Problems, as I know to be moſt uſeful and neceſſary for all ſorts of Artificers, as *Carpenters*, *Joiners*, *Maſons*, &c. I ſhall now ſhew how the Ingenious Artificer may attain to the taking of Heights and Diſtances by help of his Square, and two Foot Rule.

How

How the Ingenious Artificer may by help of his Square, *and* 2 Foot-Rule, *attain to the taking of* Heights *and* Distances.

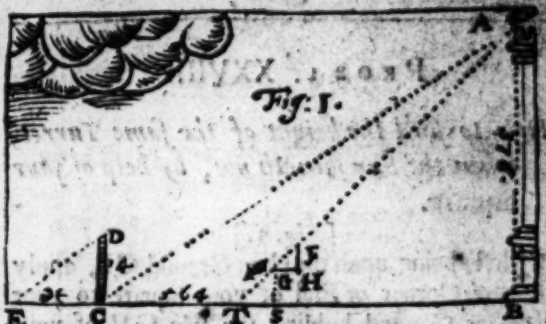
Prob. XXVII.

How by help of your 2 *Foot* Rule, *to take the Height of any Tree, Tower, or Steeple, by the Shadow thereof.*

LEt AB be a Tree, Turret, Steeple, May-Pole, or the like, casting its Shadow upon plain ground from B to C, and you would know the Height thereof.

First, at C, or on any other plain ground, erect your 2 Foot Rule perpendicular, and observe how far that casteth its shadow, which suppose to E, at the same time that the Turret A B casts its shadow to C.

Secondly,



Secondly, make 2 Marks upon the Ground where both the ſhadows terminate, one at C, and the other at E Then

Thirdly, Meaſure the length of the ſhadow of your two Foot Rule E C, which ſuppoſe to be 36 Inches; Alſo meaſure the length of the ſhadow of the Turret B C, which ſuppoſe to be 47 Foot, or 564 Inches; theſe two meaſures being obtained, you may come to the knowledge of the height of the Tower, as followeth.

Thirdly, Multiply 564, the length of the ſhadow of the Turret by 24 (the number of Inches in your 2 Foot Rule, and the Product will be 13536, which being divided by 36 Inches, the length of the ſhadow of your Rule, giveth in the Quotient 376 Inches, which is 31. Foot, and 4 Inches, and that is the height of the Tower A B.

Probl. XXVIII.

How to find the height of the same Turret, when the Sun shineth not, by help of your Square.

[*Fig.* 1.]

First, being upon the plain Ground CB, apply one Corner or End of your Square to your Eye, as G, and holding the side GH of your Square level, (which you may do by having a Thred and Plummet fastned at F,) move towards the Turret, till by your Eye, and the two arms of your Square G and F, you see the very top of the Turret at A.

Then Secondly, Note the place of your standing, which will be at S, and from S, backwards to T, measure the heights of your Eye from the Ground.

Lastly, Measure the distance from T to B, which distance shall be equal to the height of the Turret AB.

Prob. XXIX.

How by the help of your Square *to find the distance from you to some other place that you can see, though you cannot come near the same.*

[*Fig.* 2.]

Suppose you were standing at A, and it were required of you to find how far you are distant from the Tree at B, which you cannot come near to, because of the River at C.

First, at A (the place of your standing) erect a Staff, as A D, of a known length; as suppose 4 Foot, or 48 Inches, having a Notch cut in the top

Fig. II.



thereof, in which the Square must hang so, that it may be moved upwards or downwards at pleasure,

Your Square hanging thus upon the top of the Staff, direct the end of it towards the Tree at B, and with your Eye look along the side of the Square, till you see the very bottom of the Tree at B.

Then keeping the Square thus fixed, strain a small Thred or Line from the corner of the Square at D along the side thereof, till it touch the ground at E

This done, Measure the distance from A to E, which suppose to be 1 Foot and a quarter, or 15 Inches.

Then, To find the distance A B, so many times as AE is contained in AD, so many times is AD the length of the Staff, contained in A B the distance required.

Wherefore, Multiply 48 Inches the length of the Staff by 48, and the Product will be 2304, which being divided by 15 Inches, the distance A E, the Quotient will be 153 and $\frac{1}{3}$ Inches, which is 12 Foot 9 Inches, and $\frac{1}{3}$ of an Inch, which is somewhat more than half an Inch.



PROBL. XXX.

Prob. XXX.

The length of a Ladder being known, and how far the Foot thereof is distant from the bottom of any Wall against which it standeth being also known, to find to what height of the Wall the Ladder reacheth.

[*Fig.* 3.]

THere is a Ladder, as A B, which is 35 Foot long, and it is set against a Wall, so that the



Fig. III.

Foot of the Ladder at B is removed from the bottom of the Wall at C 21 Foot, I would know what height of the Wall the Ladder reacheth, that is, I would know what is the height of A C.

Firſt, Multiply 35 the length of the Ladder by 35, and the Product will be 1225. Alſo Multiply 21 (the diſtance which the Ladder ſtandeth from the Wall) by 21, the Product is 441, which being Subſtracted from the former 1225, there remains 784, the Square Root whereof being extracted is 28, and ſo high doth the Ladder reach upon the Wall from C to A.

Prob. XXXI.

The length of a Ladder being known, to find at what diſtance it muſt ſtand from the Wall, to reach to ſuch a height as ſhall be deſired.

THe Ladder A B is 35 Foot long, and it is required to ſet it againſt the Wall C A, ſo that it may reach to 28 Foot. Multiply the Ladder 35 by 35, the Product is 1225, as before, alſo Multiply 28 by 28, the Product is 784, which Subſtract from 1225, there remains 441, the Square Root whereof being Extracted, is 21, and ſo many Foot muſt

must the Ladder be removed from the bottom of the Wall.

I might here instance in divers other the like Conclusions, but they require more Arithmetical skill, than is usual among Artificers. Wherefore I will reserve them, and divers others to be resolved by the following Table, which performeth them with great ease and exactness

BRITISH MUSEUM 16 NO 1925

A DIRECTION For PLAIN & SOLID MEASURE By the ordinary 2 FOOT RULER; Furnished with SCALES necessary for that purpose.

The RULER *is furnished with* 5 SCALES.

I.  SCALE of equal Inches, standing at one edge of the Ruler; Numbered from 1 to 24, each Inch is Subdivided into 10 equal parts. This is called therefore, *The* SCALE *of* DECIMAL INCHES.

II. An unequal Scale, set also at another edge of the Ruler, Numbred from 6 down to 60: each of these greater parts is Subdivided into 10 lesser parts, actually where there is room, or else supposedly when the Spaces grow shorter. To the beginning of this Scale is annexed a little Table, supplying those main Divisions from 1 to 6, which the Ruler cannot receive for want of Length. This is commonly called, *The Scale of Board Measure.*

III. Another unequal Scale set in any place of the Ruler, Numbred from 1 to 10, and so forwards to 100, and Subdivided decimally as quantity will allow. And from the Numbring of it, it is here called, *the Scale of* 100.

IV. Two Scales set close together edge to edge in any spare place of the Ruler. One of them is equally Divided, the other unequally.

V. That which is equally divided doth take up the just whole length of the Ruler, and is numbred up to 48, each part being half an Inch, answering to the half Inches upon the Ruler. That which is unequally divided goes up to 50. And according to these numbers they are nominated; One, *the Scale of* 48: the other, *the Scale of* 50. They are Subdivided also decimally.

The Scale of Board-measure begins at 6, and ends at that limb must be numbred down to 60, that so it may contain a just Decad of Numbers, and thereby made fit to Measure a very great, or a very small quantity.

A Very great quantity, that exceeds 60, and yet is to be counted upon the Scale of *Board Measure*, must be divided by 10 or 100 [so for 70 you must take 7, for 125 take 12 ½, *&c.* of the rest] and that Number so divided, must be counted upon the Scale; which term of accompt will give a length: and this length must be Multiplyed again by 10 or 100, and then the Product will give the length of a Foot, *&c.*

A very small quantity, that falls under the number 6, and yet is to be counted upon the Scale of *Board-measure*, must be Multiplyed by 10 or 100 [so for 4 you must take 40, or for 1 you must take 10, or for $\frac{1}{10}$ you must take $\frac{10}{10}$, that is 3, *&c.*] and that Number so Multiplyed, must be counted upon the Scale; and at the term of it, you shall have a length. This length must then be Divided by 10 or 100, and the Quotient will give the length of a Foot, *&c.* And if in small things you would know how many Solid Inches are contained in the content of Solid Foot-Measure found out the former way; Say, As 1 to 1728, so the content in Foot-Measure to the content in Solid Inches.

The principal uses of these Scales are laid down in the Precepts that follow.

There are two ways of Measuring commonly used. One is, to find the content of the whole immediately. The other is, to find the Length of a Foot first, and afterwards by help of it to measure how many Feet are contained in the whole. This latter, because it is most in use, and best known, I intend to follow in these Precepts.

I. *To Measure* Squared Board, *or such as is of the same Bredth.*

First, Measure the Bredth of the Board by the Scale of Decimal Inches. Then count that Bredth upon the Scale of Board-measure; So shall the distance from that Number, to the end of the Ruler next to 60, give the Length of One Foot. This Length, either upon the Ruler it self, or taken from thence in a pair of Compasses if it be turned as oft as may be upon the Board, will shew how many Square Feet are therein contained. And each one of these Lengths is a true Superficial Foot, by which any number of Feet may be cut off from the Board.

II. To *Measure* Tapering Board, *or such as is of more Bredth at one end, than it is at the other.*

MEasure the Bredth of both ends with the Scale of Decimal Inches, adde them together, and take half the Sum; which half Sum is the Mean Bredth between the two former. Supposing then this Mean Bredth to be the true Bredth, count it (as you did before) upon the Scale of Board-measure; For, the distance from thence to the end of the Ruler neareſt 60, gives the Length of such a Foot as will Measure the Content of the whole. If therefore you take the Length, and Measure it, as oft as you can upon this Length of the Board, (which Length is measured by the Line drawn quite along the midſt of it) look how many times it is thereon contained, so many Square Feet doth the whole Board contain.

But then it muſt be noted, that each of theſe Lengths is not a true Superficial Foot, for at the broader end of the Board, it is more, at the narrower end, it is leſs: and therefore what was before said of cutting off any number of Feet in Board all of an equal Bredth, will not hold true in tapering Board. Now how this should be done, shall be shewed in another place, for it is too hard for common Measuring.

III. *To Measure* Squared Solids, *such as are Rectangular, and quite through of the same bigness.*

THe Bases of all Solids here measured, must be supposed to be Perpendicular to the Axis in Cones and Pyramids, or to the Plains and Sides of Parallelepipids, and all other Prismes.

Squared Solids are Rectangled Parallelepipids. To find the Content of these; you must first measure the Bredth and Depth of the Base, with your Scale of Decimal Inches. Then (upon the Line of 100) from 12 extend your Compasses to the Breadth, the same extent shall reach from the Depth to a Fourth number: which being counted in the Scale of Board-measure, will shew the Length of one Solid Foot; The Length (I say) of one Solid Foot will be, from that Fourth number to that end of the Ruler, which is next 60. This Length being Measured as oft as it can be upon the Timber, will give the Number of the Solid Feet therein contained. And each one of these Lengths is a true Solid Foot, whereby any number of Feet may be cut off from the Timber.

If it fall out that the 4th. number be too great to be counted upon the Scale of Board-measure,

then count $\frac{1}{10}$ part of it only, upon the same Scale, and referring it to the Line of Inches, it will shew the Length of 10 Feet; therefore $\frac{1}{10}$ part of that Length, is the Length of one Foot. Or again, if it happen that the 4th. number be too small to come upon the Scale of Board-measure, then count 10 times that number upon the same Scale, and look what Inches do answer to it, the same Multiplyed by 10, will give the Length of 1 Foot. And these 2 Cautions must be observed in the like cases, when they shall happen in the Precepts following.

IV. *To Measure such* Parallelepipid Solids *as are fashioned at their Bases like Rhombs or Rhomboids.*

THe Bases of the former Solids were Rectangular Parallelograms; but the Bases of the Solids here mentioned are either Rhombs or Rhomboids; the rest of the Plains going quite through the Length, as supposed to be Rectangular Parallelograms, as the former also were. Now to Measure these; you must first (with your Scale of Decimal Inches) take the Breadth of the Base; And Secondly, you must (by the same Scale) Measure the Perpendicular Depth of the Solid, or that Line which falls Perpendicular to both the upper and

lower Lines of the Base; and this you must call the Depth of the Base. When this is done, the rest of the work is directly the same as it was before. For upon the Line of 100 you are to number this Breadth and Depth; and if you extend your Compasses from 12 to the Breadth, the same extent shall reach from the Depth to a 4th. Number. This 4th. Number must be counted upon the Scale of Board measure; for from that Number, taken in that Scale to the end of the Ruler towards 60, gives the Length of one Solid Foot. And this Length being Measured as often as it may upon the Timber, shews the Solid Content of the same. And here also each one of these Lengths is an intire Solid Foot: so that any number of Feet may thereby be cut off from the Timber.

To Measure Squared Tapering Solids.

Such Tapering Solids are here meant only, as do either end in a Point, or else (though they be cut off) such as being continued would end in a Point as Pyramides do. That is to say, Here is shewed a way how to Measure either intire Pyramides, or else Resected Pyramides, whose Bases are either Rectangular Parallelograms, or Obliquangled Parallelograms, such as Rhombs or Rhomboids before-mentioned.

To

V. *To Measure Timber of a Pyramidal form.*

FIrst, by the Scale of Decimal Inches, Measure the Breadth of the Base and the Depth of it likewise, as is declared before in the third and fourth Precepts. Then upon the Line of 100 count this Breadth and Depth: and extend your Compasses from 36 upon that Line to the Breadth, the same extent will reach from the Depth to a 4. number. Count this 4th. number upon the Scale of Board-measure, for from thence to the end of the Ruler towards 60, gives a Length. This Length Measured as oft as you can upon the Pyramides Length (which is the Axis from the middle point of the Base to the vertical point of the Pyramide,) gives the number of Solid Feet contained in the whole. And here also, (as before in Tapering Board) one of these Lengths at the great end is more than a just Solid Foot, and at the least end it is less. And how to cut off a just Solid Foot, will be a work too hard to be shewed to common Measurers. It must therefore be omitted, as also in all the Tapering Solids that follow.

VI. To

VI. *To Measure Tapering Timber of a Resected Pyramidal Form.*

THe first work will be to Measure the Breadth and Depth of the greater Base, by the Scale of Decimal Inches, as is before declared. Then extend your Compasses from 36 (upon the Line of 100) to the Breadth counted upon the same Line, the same extent will reach from the Breadth to a 4th. Number. Then Measure both the Breadths, (or both the Depths, which you will, for they are proportional one to the other) in the greater and lesser Bases with Decimal Inches, and count their quantities upon the Line of 100, and take the distance of them with your Compasses. For this distance shall reach (upon the same Line of 100) from the precedent 4th. Number (downward toward the beginning of the Line) to a 5th, and from the 5th, to a 6th. Adde these three, namely, the 4th, 5th, and 6th. numbers together. The Sum of them count upon the Scale of Board-measure; for from thence to the end of the Ruler which is next 60, gives a Length. This Length turned upon the Timbers Length (which is to be estimated by the Axis thereof, or right Line passing through the two Centres of the two Bases) as oft as it may, will give the Number of Solid Feet contained in the whole Resected Tapering Timber.

VII. *How to Measure Timber of a Pyramidal Form, whose Base is Triangular.*

IT matters not whether the Base be a Triangle Ordinate (of equal Sides and Angles) or Inordinate, (each Side differing one from another;) for the work in them all is generally one, thus namely. Count any Side of the Triangle as the Base thereof, and the Angle opposed thereto, is to be called the Vertical Angle. Then Measure the Base, and the Perpendicular falling thereon from the Vertical Angle, both with the Line of Decimal Inches. This done, extend your Compasses from 7.8 (upon the Line of 100) to the Base counted thereon, the same extent shall reach from the Length of the Perpendicular to a 4th. number. Count this 4th. Number upon the Scale of Board-measure, and so proceed as in the 5th. Precept.

VIII. *How*

VIII. *How to Measure* Tapering Timber *of a Resected Pyramidal form, whose two Bases are of a Triangular form.*

THe Bases may be of any Triangular form, whether ordinate or inordinate, as in the former Precept was intimated: only it is requisite, that the two Bases be like each other, that is, Equiangled and of proportional sides, as that must of necessity be if the Timber be part of a Cone, such as this Proposition supposeth it to be.

Measure the Base of the Triangle at the greater end, and the Perpendicular falling thereon, with the Scale of Decimal Inches, as was shewed in the last precedent Precept. Then upon the Line of 100) extend your Compasses from 72, to the Length of the Base (counted upon the same Scale:) the same extent will reach from the Perpendicular to a fourth Number. Then Measure any two like sides (of the 2 Bases of the Timber) with the Scale of Decimal Inches, and count the Numbers of them upon the Line of 100, and take the distance of them in your Compasses. This distance will reach from the 4 Number downwards to a 5 and from that 5 to a 6. Adde these 4th. 5th. and 6th. numbers all into one Sum, this Sum counted, upon the Scale of Board-measure, gives a Length from that end of the Ruler which is neerest to 60. And this Length turned upon the Length of the Timber as oft as it may, gives the number of Solid Feet contained in the whole Resected Timber.

IX. *How*

IX. *How to Measure a* Pyramide, *whose* Base *is of a Multangular Ordinate Figure.*

ORdinate plain Figures, are such as are Equiangled and Equilateral. Pyramides of an Ordinate Triangular form may be Measured by the 7th. general Precept for Triangular Bases: and those Pyramides that have Ordinate Quadrangular Bases (that is, true Square Bases) may be Measured by the third general Precept for Rectangular Solida. This 9th. Precept shews how to do the same work in Pyramides of Multangled and Ordinate Bases.

And note here in general, for this and all the Precepts that follow concerning Multangled Ordinate Bases, that the Radius of the Base is a right Line drawn from the Centre of the Base, and falling Perpendicularly to one of the sides of the Polygon, and not the Line from the Centre to any of the Angles of the Base. Then to go forward, Measure the Radius of the Base, and the whole Perimeter thereof also, [which may be done by a Line put round about it, and then Measuring that Line afterwards] upon the Scale of Decimal Inches. Which done, extend your Compasses from 72 (upon the Scale 100) to the Perimeter counted thereon; the same extent will reach from the Perpendicular or Radius to a 4th. number. Count this 4th. number, *&c.* as in the 5th. Precept.

X. *How*

X. How to Measure Resected Pyramides, whose two Bases are of Multangled Ordinate Forms.

MEasure the Radius, and whole Perimeter of the greater Base, as before. And extend your Compasses from 72, to the Perimeter, the same extent will reach from the Radius (counted as the former were, upon the same Scale of 100) to a 4th. Number. Then again Measure (by your Scale of Decimal Inches) any two Lines upon the two Bases (as the two Radiuses, or the two sides, or the two Perimeters, or any like Diagonals,) and count the Numbers of them upon the Scale of 100, and take their distance; for this distance will reach from the 4th. Number (counted upon the Scale of 100) downwards to a 5th. and from thence to a 6th. Add these three Numbers, the 4th, 5th, and 6th. together, and count their Sum upon the Scale of Board-measure, as before was shewed in the 6th. Precept.

XI. How

XI. *How to Measure Prisms, whose Bases are of any Triangular Form, and both congruous to each other.*

WIth your Scale of Decimal Inches, Measure the Perpendicular and Base of the Triangular Base, as before in the 7th. and 8th. Precepts. Then count (upon the Line of 100) the Base, and extend your Compasses from 24 (upon the same Line) to the Base, the same extent will reach from the Perpendicular, to a 4th. Number, which being counted in the Scale of Board-measure, &c. as in the third Precept. And each of these Lengths is a true Solid Foot, whereby, &c. as in the third Precept.

XII *How to Measure Prisms, whose Bases are of any Ordinate Multangled Figure.*

THose Prisms that are here Measured, are such Solids as are of equal and congruous Bases at both ends, and all the other Plains going along the whole length of such Solids, are Rectangled Parallelograms:

If the Prisme to be Measured be of a Quadrangular Ordinate Base, (that is of a just Square Base) then it may be Measured by the third Precept, which is general for all Bases of a Parallelogram Form, and so consequently also of the Square or Ordinate Parallelogram Figure.

But

But if the Base be of a Multangled ordinate Figure, you must first Measure the Radius and Perimeter thereof, by the Scale of Decimal Inches. Then counting the Radius and Perimeter upon the Line of 100; extend your Compasses from 24 to the Base, the same extent will reach from the Perimeter to a 4th. Number. [Or extend your Compasses from 24 to the Perimeter, the same extent will reach from the Base to the same 4th. Number.] Count this 4th Number upon the Scale of Board-measure, so shall the Length (from thence to the end of the Ruler next 60) give the length of one Foot Solid. Measure therefore this length upon the Solid Timber as oft as you can, for the Number of those Lengths sheweth the number of Solid Feet contained in the whole. And each one of these lengths is a just Solid Foot, whereby any number of Feet may be cut off.

The

The Measuring of such Solids whose Bases are Circular; as Cylinders, Cones, Barrels, *and such like.*

XIII. *To find the number of Solid Feet contained in a* Cylinder.

IN the Precepts that follow, the two Scales whose edges lie close together, are to be used. First, measure the Diameter of one the Cylinders Bases, by the Scale of Decimal Inches. Then count the Length thereof upon the equal Scale of 48, and over against it (in the annexed unequal Scale) you shall find another number. Let this other number be reserved. Then upon the Line of 100, extend your Compasses from 12, to 36, the same extent shall reach from the reserved number (counted upon the same Line of 100) to a 4th number. Count this 4th number upon the Scale of Board-measure; for from that number, to the end of the Ruler towards 60, gives the Length of one Solid Foot. And this Length turned upon the Length of the Cylinder, shews the number of Solid Feet contained in the whole Cylinder. And here also each one of these Lengths is a just Solid Foot, whereby any number of Solid Feet may be cut off.

XIV. *To find the Solid Content of a* Cone.

MEaſure the Diameter of the Baſe by your Scale of Decimal Inches. Count that Length upon the Scale of 48, and ſee what number in the Scale of 50 ſtands over againſt it. Count this number upon the Scale of Board-Meaſure, ſo ſhall you find a Length, which being turned (in the manner that hath been often mentioned) upon the Cones Length, gives the Content of the whole Cone.

XV. *To find the Solid Content of a* Reſected Cone.

FIrſt, Meaſure the Diameter of the greater Baſe by the Scale of Decimal Inches; and count the number thereof upon the Scale of 48; over againſt which you ſhall ſee another number in the Scale of 50, which muſt be reſerved. Then again, take the Length of the Diameter of the leſſer Baſe in Decimal Inches. Count the Lengths of the two Diameters ſo meaſured, upon the Scale of 100, and take their diſtance with your Compaſſes. Then keeping this extent, count the Reſerved Number upon the Scale of 100, and extend the Compaſſes from that number downward to a ſecond leſſer number, and from that ſecond to a third ſtill leſs. Add this firſt, ſecond, and third numbers together,

and

and count the Sum of them upon the Line of Board-Measure, where you shall find that length which will Measure the Content of Solid Feet in the whole, in such manner as hath been often shewed before.

XVI. *Of Gauging Vessels.*

WE have now done with the Scale of Board-Measure, which hath been of good use in all the 15 Propositions going before. In this Proposition of *Gauging*, all the Mensurations must still be made by a Scale of Inches decimally divided. But because the Ruler is not of Length enough to Measure the Diameters and Lengths of Vessels, especially to Measure that Diameter which is at the Bong; nor is it convenient that it should be soiled with any thing, (which it must be, if it be put into any full Vessel,) it will therefore be most expedient, that a small Staff be made fit to undergo such servile uses; and for that purpose may be of 4 or 5 Feet in Length, divided into Inches, and each Inch Subdivided into 10 parts, as the Scale of Decimal Inches is upon the Ruler. They are to be numbred (not by Feet but) outright by 1, 2, 3, 4, 5, &c to 48 or 60. It may be also furnished with convenient appurtenances for the more expedite and dextrous Mensuration of the Length and Diameters of any Vessel, as every Man shall best contrive for his own satisfaction.

1. With this Staff Measure the inner Diameters

at the Head and Bong, and the inner length of the Veſſel. For the Diameter at the Bong, the Staff is to be put into the Veſſel at the Bong-hole. The Diameter at the Head may be Meaſure'd on the outſide, allowing ſomewhat more than the very outer Diameter, becauſe of the Arching of the Veſſel. The length may be Meaſured on the outſide alſo from Head to Head, allowing for the thickneſs of the two Heads what ſhall be competent. If any think other ways better, they may uſe them.

2. Count the number of Inches in the Diameter of the Bong, upon the equal Scale of 48 upon your Ruler; and note in the Scale of 50, what number ſtands againſt it. Write down this number twice, one right under the other. And again, count the number of Inches in the Diameter at the Head upon the ſame Scale of 48, and look in the Scale of 50 what number ſtands even along with it. Write this number juſt under the two former. Then add all three numbers together, keeping the Sum.

3. Upon the Line of 100 extend your Compaſſes from 19 25 to the length of the Veſſel, the ſame extent will reach from the Sum before kept, to the number of Wine-Gallons contained in the Veſſel. Or if you extend your Compaſſes from 22 69 to the length of the Veſſel 24, it muſt be, If 288 Solid Inches go to one Ale Gallon, as is found at the Exciſe-Office, the ſame extent will reach from the Sum before kept, to the number of Ale-Gallons contained in the Veſſel. *For*

For Example.

The Diam. at the Bong 36 Inches, counted in the Scale of 48, ſhews in the Scale of 50 — 28.30

28.30

The Diam. at the Head 30 Inches, counted in the Scale of 48, ſhews in the Scale of 50 — 19.64

The Sum of all three. —— 76.24

The Length of the Veſſel ſuppoſe to be 4 Foot, or 48 Inches.

Then work upon the Line of 100 thus. As 19 $\frac{25}{100}$ is to 48 the length: ſo 76 24 the Sum, to 190 the number of Wine-Gallons in the Veſſel.

And as 24 is to 22,69 is to 48, ſo 76 24 to 152 $\frac{22}{100}$ 161, the number of Ale-Gallons in the ſame Veſſel.

This is done upon the Ruler. And if the Calculation had been made in greateſt exactneſs by numbers, the Wine-Gallons would have been 198 $\frac{91}{100}$, and the Ale-Gallons 152 $\frac{1}{100}$ 161 $\frac{7}{100}$ no conſiderable difference.

Note that 190 and 152 $\frac{1}{2}$ 161 being greater numbers than the Scale (which goeth but to 100) containeth, are counted upon the lower part of the Scale, where 7 is for theſe kinds of numbers called 70; 8 is called 80; 10 for 100; 16 for 160; 19 for 190; 20 for 200; and ſo all the reſt futably.

This way of Menſuration ſuppoſeth a Barrel to be a part of a Spheroids, the two ends equally cut off, which having the moſt probable ground muſt perform therefore moſt true.

But

at the Head and Bong, and the inner length of the Veſſel. For the Diameter at the Bong, the Staff is to be put into the Veſſel at the Bong-hole. The Diameter at the Head may be Meaſured on the outſide, allowing ſomewhat more than the very outer Diameter, becauſe of the Arching of the Veſſel. The length may be Meaſured on the outſide alſo from Head to Head, allowing for the thickneſs of the two Heads what ſhall be competent. If any think other ways better, they may uſe them.

2. Count the number of Inches in the Diameter of the Bong, upon the equal Scale of 48 upon your Ruler; and note in the Scale of 50, what number ſtands againſt it. Write down this number twice, one right under the other. And again, count the number of Inches in the Diameter at the Head upon the ſame Scale of 48, and look in the Scale of 50 what number ſtands even along with it. Write this number juſt under the two former. Then add all three numbers together, keeping the Sum.

3. Upon the Line of 100 extend your Compaſſes from 10 25 to the length of the Veſſel, the ſame extent will reach from the Sum before kept, to the number of Wine-Gallons contained in the Veſſel. Or if you extend your Compaſſes from 22 69 to the length of the Veſſel 24, it muſt be. If 288 Solid Inches go to one Ale Gallon, as is found at the Exciſe-Office, the ſame extent will reach from the Sum before kept, to the number of Ale-Gallons contained in the Veſſel.

For Example.

The Diam. at the Bong 36 Inches, counted in the Scale of 48, shews in the Scale of 50 — 28.30

28.30

The Diam. at the Head 30 Inches, counted in the Scale of 48, shews in the Scale of 50 — 19.64

The Sum of all three. — 76.24

The Length of the Vessel suppose to be 4 Foot, or 48 Inches.

Then work upon the Line of 100 thus. As 19 $\frac{25}{100}$ is to 48 the length: so 76.24 the Sum, to 190 the number of Wine-Gallons in the Vessel.

And as 24 is to 22,69 is to 48, so 76.24 to 152 $\frac{42}{100}$ 161, the number of Ale-Gallons in the same Vessel.

This is done upon the Ruler. And if the Calculation had been made in greatest exactness by numbers, the Wine-Gallons would have been 198 $\frac{95}{100}$, and the Ale-Gallons 152 $\frac{14}{100}$ 161 $\frac{7}{100}$ no considerable difference.

Note that 190 and 152 $\frac{1}{2}$ 161 being greater numbers than the Scale (which goeth but to 100) containeth, are counted upon the lower part of the Scale, where 7 is for these kinds of numbers called 70, 8 is called 80, 10 for 100; 16 for 160, 19 for 190, 20 for 200, and so all the rest suitably.

This way of Mensuration supposeth a Barrel to be a part of a Spheroids, the two ends equally cut off, which having the most probable ground must perform therefore most true.

But

But if any desire to go by the usual way of Mean Diameter, *I will for their satisfaction set it down here also.*

HAving then the two Diameters at the Head and Bong, take their difference; and (upon the Line of 100) extend your Compasses from 10 to 7, the same extent shall reach from that difference (counted upon the same Line of 100) to a 4th number; which 4th Number if it be added to the Diameter at the Head, it will make the Mean Diameter required. This Mean Diameter thus found, must be counted upon the Scale of 48, and in the Scale of 50 over against your Mean Diameter, you shall find a number which is to be reserved. Then go again to you Line of 100, and say, as 6 $\frac{41}{100}$ is to the reserved number, so is the Length to the number of Wine Gallons in the Vessel. And as 8 $\frac{156}{1000}$ is to the reserved number, so is the Length to the number of Ale Gallons. This work (in the former Example) will find the Mean Diameter to be 34 $\frac{1}{10}$, and the reserved number also 29 $\frac{1}{2}$, the Content of the Vessel in Wine Gallons 181 almost, the Content of the same Vessel in Ale Gallons, almost 162 $\frac{153}{1000}$, if 288 Solid Inches go to the making of one Gallon. These do somewhat differ from the former, yet in regard of the inequality of the inside of the Vessel, and the uncertainty of the Vessels true Figure, they may be near enough to truth.

Sa mith of Gauging.

How

How to Measure Cartridges *of* Powder, *to know how many* Pounds *are contained in them.*

XVII. *And first, if the Cartridge be of a Cylindrical Figure.*

APply the Line of 50 to the Diameter of the Cylinder, and see what number of those unequal parts it reacheth unto. Then Measure the length of the Cylinder by the Scale of Decimal Inches. Afterwards upon the Line of 100 work thus; Extend your Compasses from 3 $\frac{1}{10}$ to the number of the Diameter before found by the Scale of 50; the same extent will reach from the number of the Cylinders length, to the number of the Pounds of Gun-powder therein contained.

XVIII. *Secondly, if the Cartridge be in form of a* Resected Cone.

APply the Line of 50 to the greater Bases Diameter, and note what number it reacheth unto. Then Measure the two Diameters of the two Bases by the Scale of Decimal Inches. After, upon the Line of 100, count these two Diameters, and take the distance of them with your Compasses. Then setting one Foot of that extent upon the first

number (taken out of the Line of 50, and counted now upon the Line of 100) which will reach (downwards towards the beginning of the Line at 1) to a second number, and from that second (ſtill downwards) to a third. Adde theſe firſt, ſecond, and third numbers together into one Sum, and Meaſure the length of the Reſected Cone by the Scale of Decimal Inches. Then again (upon the Line of 100) extend your Compaſſes from 11,$\frac{11}{100}$ to the forenamed length, the ſame extent ſhall reach from the Sum of the 3 numbers before found, to the number of Pounds of Gun-powder contained in the Reſected Cone.

Or thus you may do. Apply the Line of 50 to the Diameters of both Baſes, and note the numbers, and count them upon the Line of 100, and divide the diſtance of them upon that Line into two equal parts, and note the middle number upon which the Compaſs Foot falls. Then add theſe three numbers (the two extremes and the middle one now found) into one Sum, and Meaſure the length of the Reſected Cone by the Scale of Decimal Inches. Then again, &c. as in the former way.

XIX. *Thirdly,*

XIX. *Thirdly, If the Cartridge should be in form of a perfect* Cone.

APply the Line of 50 to the Diameter of the Base, and note what number it extendeth unto. Then measure the length of the Cone by the Scale of Decimal Inches. After this, (upon the Line of 100) extend your Compasses from [illegible] to the length of the Cone; the same extent will reach from the first noted number (of the Diameter of the Base), to the number of Pounds of *Gunpowder* contained in the Cone.

These Scales may be applyed to divers other like uses; but for the present let these Propositions suffice.

S. F.

March 9. 164½.

Other Precepts for the *Menſuration* of *PLAINS* & *SOLIDS*.

Sect. I.

Of Plain Meaſure taken with a Foot, Yard, or Chain, divided into Decimal parts.

BOARD and GLASS is commonly Meaſured by the Foot. Wherefore, if a Board be Meaſured with a Foot-meaſure divided into 100 equal parts, and (B) the Breadth Multiplied by (L) the Length, the Product will ſhew (C) the Content in Feet and Decimal parts of a Foot.

1 Example.

A Board is Feet 1,25 Broad, and Feet 13.45 long. How many Foot doth it contain in all?

Multiply 13.45 by 1.25, the Product will be Feet 16.8125, the Content of that Board in Feet, and Decimal parts.

For { 1 . B :: . L : C .
{ 1 . 1.25 :: 13.45 16.8125 .

2 Example.

A Pane of Glaſs being Feet 0.87 Broad, and Feet 0.92 Long, what is the whole Content?

Say, { 1 . B :: L . C
{ 1 . 0.87 :: 0.92 . 0.8004 . the content.

Paving

Paving, *Plaistering*, *Painting*, and *Wainscot* is commonly Measured by the Yard, every Square Yard containing 9 Square Feet. Wherefore if a Piece of *Paving*, &c. be Measured with a Yard divided into a 1000 equal parts, and (B) the Breadth, Multiply by (L) the Length, the Product will shew (C) the Content in Yards and Decimal parts.

Example.

A piece of *Paving* being Yards 3.5 Broad, and Yards 17.75 Long; how much is the Content?

Multiply 17.75 by 3.5, the Product will be Yards 62.125, the Content of that *Pavement* in Yards and Decimal parts.

1 . B :: L . C

As 1 . 3.5 :: 17.75 . 62.125, the Content.

But if the same *Pavement* had been Measured with a Foot divided into 100 equal parts, the Breadth would have been found to be Feet 350, and the Length Feet 5325, which Multiply together, the Product would shew Feet 558125 for the Content in Feet, which being divided by 9, the Quotient will be Yards 62.125, the Content in Yards and Decimal parts, according with the former Example.

A Parallelogram or four sided Rectangle Superficies being given, to find the length of a Superficial Foot.

Take

Take with your Ruler the breadth thereof in Feet, and Decimals of a Foot: and by the breadth so taken, divide 1. the Quotient shall be the length of 1 Superficial Foot.

Example.

A Board is Feet 1.25 broad, how much thereof will make a Foot?

Divide 1 Foot by B 1.25, the Quotient will be 0.8 for L the length of a Foot. Likewise, if the breadth be measured with a Yard, divide 1 Yard by the breadth, the Quotient will shew the length of 1 Yard.

Tiling, *Slating*, and *Flooring* is commonly reckoned by the *Square*, which is 10 Foot every way, in all 100 Foot.

Example. There is a Roof, Feet 16.25 broad, and Feet 95.2 long; How many *Squares* is contained therein?

Multiply the length B × L by the breadth, the Product will be Feet 1547, which number being divided by 100, the Quotient will be *Squares* 15.47 the Content required to be known, that is $\frac{BL}{100}$ = Area in *Squares*.

Or if you desire to know the length of a Square, divide 100 by the breadth, the Quotient will be Feet 6,154—almost; so much shall be the length of one Square of that breadth, that is $\frac{100}{B}$ = the length of a Square.

Sect. II.

Of Solid Measure taken with a Foot divided into 100 *equal parts.*

HAving (S) the side of a Square, equal to $\sqrt{BA}$ the Base of a Solid, and L the length thereof given in Foot-measure; to find (C) the Content thereof in Feet. Say.

1 . S :: L . Q :: Q . C
1 . $\sqrt{BA}$ :: L . Q :: Q . C

That is, Multiply the side given by the length; and again, Multiply that Product by it self, and then divide that last Product by the length, the Quotient will shew the Content in Feet, and Decimal parts.

Example.

Suppose a Square Solid whereof the side is Feet 2.25, and the length Feet 20.3; I require the Content.

Multiply (L) 20.3 by (S) 2.25, the Product will be (Q) 45.675. Again, 45.675 Multiplied by 45.675, the Product will be 2082.464025, which divided by L 20.3, the Quotient will be Feet 10584434 the (C) Content sought.

Having

Having the (S) ſide of a Square equal to (B A) the Baſe of a Solid given in Foot-meaſure. To find the Length of a Foot Solid in Foot-meaſure. Say,

S . 1 :: 1 . Q :: Q. the Length of 1 Foot.

That is, Divide 1. by (S) the ſide of the Square given, and Multiply that Quotient by it ſelf; the Product will ſhew the Length of a Solid Foot.

Example.

Suppoſe (S) the ſide of a Square equal to (BA) the Baſe of a Solid be Feet 2.25; I demand how much in Length will make a Solid Foot.

Divide 1.000 by 2.25; the Quotient will be 04444+, the Length of a Foot Solid.

Having (B) the Breadth, and (D) the Depth of a Squared Solid given in Foot meaſure; to find the Length of a Foot Solid in Foot-meaſure. Say,

1 . B :: D . B A :: Again B A . 1 :: 1. the length of 1 Foot.

Having (L) the Length, (B) the Breadth, and (D) the Depth of a Squared Solid given in Foot-meaſure; to find (C) the Content in Feet. Say,

1 . B :: D . B A. Again ſay, 1 . B A :: L . C. the Content.

Firſt, Multiply (B) the Breadth by (D) the Depth, the Product will be (B A) the Area of the Baſe. Again, (BA) Multiplyed by (L) the Length, the Product will be (C) the Content of that Solid in Foot-meaſure.

It

It is the common practice of most Carpenters, and others which use to Measure Tapering Timber, to Measure the Breadth and Depth thereof in the very middle, which they Multiply into each other, and take the Section there for the Base of a Square Solid equal to that Tapering piece, and Multiplying that Base so found, by the length of the Solid given, they take that Product for the Solid Content of that piece so by them Measured. Which manner of Measuring of Tapering Timber (though it be false, and ever giveth the Content less than ought to be,) yet Custom, and Ease are so prevalent with most, that they rather chose to follow an old Error, than to learn the Truth. But for those who are more Ingenious, and lovers of Truth, they may use this Rule ensuing, which is the true way to Measure such kind of Timber.

Find out the Bases at both ends, and Multiply the one by the other, and out of the Product thereof, extract the Square Root, then add together both the Bases: and that Square Root, and Multiply the aggregate thereof by one third part of the length, the Product will be the Content.

Example.

There is a Tapering piece of Timber, the length whereof is Feet 16.8, and the breadth of the Base at the greater end, is Feet 1.84, and the thickness thereof is Feet 1.38, which Multiplyed together, the Product will be Feet 2.5392, for the greater Base: the breadth of the Base at the lesser end,

is Feet 1.25, and the thickneſs or depth thereof is Feet 0.92, which Multiplied together, the Product will be Feet 1.15 for the leſſer Baſe; Multiply the Baſes together, the Product will be 2.92008, the Square Root whereof is 1.7058×; to which if you Add the Sums of both the Baſes, the Aggregate will be 5.395, which being Multiplied by ⅙ of the length, *ſcil.* 5.6, the Product will be Feet 30212, the Content of that piece of Timber.

Some other having taken the breadth at both ends; Add them together, and take half that Sum for the breadth in the middle; and likewiſe they find the depth in the ſame manner: then they Multiply the depth and breadth together; and laſtly, that Product Multiplied by the length, then they take that laſt Product for the Content; which manner of Meaſuring will produce the ſame Error, as the other taken by the middle Section.

There are many other ways of Meaſuring, but the following Table performeth all manner of Menſurations with great eaſe, delight, and exactneſs, and exceedeth all others, that of the Pen only excepted.

The Table follows:

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A TABLE OF PROPORTIONAL OR LOGARITHMICAL NUMBERS to 10000.

By Which *Multiplication*, *Division*, the *Rule* of *Proportion*, the *Extraction* of the *Square* and *Cube Roots*, are all of them performed by *Addition* and *Subſtraction* only:

And hereunto is added their farther Uſe, exemplified in all manner of *Menſurations*;

Num	Logarithm	Num	Logarithm	Num	Logarithm
1	0.000000	36	1.556302	71	1.851258
2	0.301030	37	1.568202	72	1.857332
3	0.477121	38	1.579783	73	1.863323
4	0.602060	39	1.591064	74	1.869232
5	0.698970	40	1.602060	75	1.875061
6	0.778151	41	1.612783	76	1.880813
7	0.845098	42	1.623249	77	1.886491
8	0.903090	43	1.633468	78	1.892095
9	0.954242	44	1.643453	79	1.897627
10	1.000000	45	1.653212	80	1.903090
11	1.041392	46	1.662758	81	1.908485
12	1.079181	47	1.672098	82	1.913814
13	1.113943	48	1.681241	83	1.919078
14	1.146128	49	1.690196	84	1.924279
15	1.176091	50	1.698970	85	1.929419
16	1.204120	51	1.707570	86	1.934498
17	1.230449	52	1.716003	87	1.939519
18	1.255272	53	1.724276	88	1.944483
19	1.278753	54	1.732394	89	1.949390
20	1.301030	55	1.740362	90	1.954242
21	1.322219	56	1.748188	91	1.959041
22	1.342423	57	1.755874	92	1.963788
23	1.361728	58	1.763428	93	1.968483
24	1.380211	59	1.770852	94	1.973128
25	1.397940	60	1.778151	95	1.977723
26	1.414973	61	1.785330	96	1.982271
27	1.431364	62	1.792392	97	1.986772
28	1.447158	63	1.799340	98	1.991226
29	1.462398	64	1.806180	99	1.995635
30	1.477121	65	1.812913	100	2.000000
31	1.491362	66	1.819544	101	2.004321
32	1.505150	67	1.826074	102	2.008600
33	1.518514	68	1.832509	103	2.012837
34	1.531479	69	1.838849	104	2.017033
35	1.544068	70	1.845098	105	2.021189

Num.	Logarithmi	Num.	Logarithmi	Num.	Logarithmi
106	2.025306	141	2.149219	176	2.245512
107	2.029384	142	2.152288	177	2.247973
108	2.033424	143	2.155336	178	2.250420
109	2.037426	144	2.158362	179	2.252853
110	2.041393	145	2.161368	180	2.255273
111	2.045323	146	2.164352	181	2.257678
112	2.049218	147	2.167317	182	2.260071
113	2.053078	148	2.170261	183	2.262451
114	2.056905	149	2.173186	184	2.264817
115	2.060697	150	2.176091	185	2.267171
116	2.064458	151	2.178976	186	2.269513
117	2.068186	152	2.181843	187	2.271841
118	2.071882	153	2.184691	188	2.274157
119	2.075547	154	2.187520	189	2.276461
120	2.079181	155	2.190331	190	2.278753
121	2.082785	156	2.193124	191	2.281033
122	2.086360	157	2. 95899	192	2.283301
123	2.089905	158	2.198657	193	2.285557
124	2.093422	159	2.201397	194	2.287801
125	2.096910	160	2.204120	195	2.290034
126	2.100370	161	2.206826	196	2.292256
127	2.103804	162	2.209515	197	2.294466
128	2.107210	163	2.212187	198	2.296665
129	2.110589	164	2.214843	199	2.298853
130	2.113943	165	2.217483	200	2.301030
131	2.117271	166	2.220108	201	2.303196
132	2.120574	167	2.222716	202	2.305351
133	2.123851	168	2.225309	203	2.307496
134	2.127105	169	2.227886	204	2.309630
135	2.130334	170	2.230448	205	2.311753
136	2.133539	171	2.232996	206	2.313867
137	2.136720	172	2.235528	207	2.315970
138	2.139879	173	2.238046	208	2.318063
139	2.143015	174	2.240549	209	2.320146
140	2.146128	175	2.243038	210	2.322219

Num	Logarithm	Num	Logarithm	Num	Logarithm
211	2.324282	246	2.390935	281	2.448706
212	2.326335	247	2.392696	282	2.450249
213	2.328379	248	2.394451	283	2.451786
214	2.330413	249	2.396199	284	2.453318
215	2.332438	250	2.397940	285	2.454844
216	2.334453	251	2.399673	286	2.456364
217	2.336459	252	2.401400	287	2.457881
218	2.338456	253	2.403120	288	2.459392
219	2.340444	254	2.404833	289	2.460897
220	2.342442	255	2.406540	290	2.462398
221	2.344392	256	2.408239	291	2.463893
222	2.346353	257	2.409933	292	2.465382
223	2.348304	258	2.411619	293	2.466867
224	2.350248	259	2.413299	294	2.468347
225	2.352182	260	2.414973	295	2.469822
226	2.354108	261	2.416640	296	2.471291
227	2.356025	262	2.418301	297	2.472756
228	2.357934	263	2.419955	298	2.474216
229	2.359835	264	2.421603	299	2.475671
230	2.361727	265	2.423245	300	2.477121
231	2.363612	266	2.424881	301	2.478566
232	2.365488	267	2.426511	302	2.480006
233	2.367355	268	2.428134	303	2.481442
234	2.369215	269	2.429752	304	2.482873
235	2.371067	270	2.431363	305	2.484299
236	2.372912	271	2.432969	306	2.485721
237	2.374748	272	2.434568	307	2.487138
238	2.376577	273	2.436162	308	2.488550
239	2.378397	274	2.437750	309	2.489958
240	2.380211	275	2.439332	310	2.491361
241	2.382017	276	2.440909	311	2.492760
242	2.383815	277	2.442479	312	2.494154
243	2.385606	278	2.444044	313	2.495544
244	2.387389	279	2.445604	314	2.496929
245	2.389166	280	2.447158	315	2.498310

Num	Logarithm	Num	Logarithm	Num	Logarithm
316	2.499687	351	2.545307	386	2.586587
317	2.501059	352	2.546542	387	2.587711
318	2.502427	353	2.547774	388	2.588831
319	2.503790	354	2.549003	389	2.589949
320	2.505150	355	2.550228	390	2.591064
321	2.506505	356	2.551450	391	2.592176
322	2.507855	357	2.552668	392	2.593286
323	2.509202	358	2.553883	393	2.594362
324	2.510545	359	2.555094	394	2.595496
325	2.511883	360	2.556301	395	2.596597
326	2.513217	361	2.557507	396	2.597695
327	2.514547	362	2.558708	397	2.598790
328	2.515873	363	2.559906	398	2.599882
329	2.517195	364	2.561101	399	2.600973
330	2.518513	365	2.562293	400	2.602060
331	2.519828	366	2.563481	401	2.603144
332	2.521138	367	2.564666	402	2.604226
333	2.522444	368	2.565847	403	2.605305
334	2.523746	369	2.567026	404	2.606381
335	2.525044	370	2.568201	405	2.607455
336	2.526339	371	2.569373	406	2.608526
337	2.527629	372	2.570542	407	2.609594
338	2.528916	373	2.571708	408	2.610660
339	2.530199	374	2.572871	409	2.611723
340	2.531478	375	2.574031	410	2.612783
341	2.532754	376	2.575187	411	2.613841
342	2.534026	377	2.576341	412	2.614897
343	2.535298	378	2.577491	413	2.615950
344	2.536564	379	2.578639	414	2.617000
345	2.537829	380	2.579783	415	2.618048
346	2.539076	381	2.580925	416	2.619093
347	2.540329	382	2.582062	417	2.620136
348	2.541579	383	2.583198	418	2.621176
349	2.542825	384	2.584331	419	2.622214
350	2.544068	385	2.585440	420	2.623249

Num	Logaritmus	Num	Logaritmus	Num	Logaritmus
421	2.624682	456	2.659964	491	2.691081
422	2.625322	457	2.659916	492	2.691965
423	2.625940	458	2.660865	493	2.692846
424	2.626565	459	2.661812	494	2.693726
425	2.627188	460	2.662757	495	2.694605
426	2.627809	461	2.663700	496	2.695481
427	2.630427	462	2.664642	497	2.696356
428	2.631043	463	2.665581	498	2.697229
429	2.632657	464	2.666521	499	2.698100
430	2.633268	465	2.667452	500	2.698970
431	2.633877	466	2.668385	501	2.699837
432	2.634483	467	2.669316	502	2.700703
433	2.635087	468	2.670245	503	2.701568
434	2.635689	469	2.671172	504	2.702430
435	2.636289	470	2.671097	505	2.703291
436	2.636886	471	2.673021	506	2.704150
437	2.640481	472	2.673942	507	2.705007
438	2.641074	473	2.674861	508	2.705863
439	2.641664	474	2.675778	509	2.706717
440	2.642252	475	2.676693	510	2.707570
441	2.642838	476	2.677606	511	2.708420
442	2.645422	477	2.678518	512	2.709269
443	2.646003	478	2.679427	513	2.710117
444	2.646583	479	2.680331	514	2.710963
445	2.648160	480	2.681241	515	2.711807
446	2.649334	481	2.682145	516	2.716137
447	2.650307	482	2.683047	517	2.717670
448	2.651278	483	2.683947	518	2.718501
449	2.652246	484	2.684845	519	2.719331
450	2.653212	485	2.685741	520	2.710153
451	2.654176	486	2.686636	521	2.716837
452	2.655138	487	2.687528	522	2.717670
453	2.656098	488	2.688419	523	2.718501
454	2.657055	489	2.689308	524	2.719331
455	2.658011	490	2.690196	525	2.720159

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
526	2.720985	562	2.749862	598	2.775336
527	2.721810	562	2.749736	597	2.775974
528	2.722633	563	2.750508	598	2.776701
529	2.723455	564	2.751279	599	2.777427
530	2.724275	565	2.752048	600	2.778151
531	2.725094	566	2.752816	601	2.778874
532	2.725911	567	2.753583	602	2.779596
533	2.726727	568	2.754348	603	2.780317
534	2.727541	569	2.755112	604	2.781036
535	2.728353	570	2.755874	605	2.781754
536	2.729164	571	2.756636	606	2.782472
537	2.729974	572	2.757396	607	2.783187
538	2.730782	573	2.758154	608	2.783903
539	2.731589	574	2.758911	609	2.784617
540	2.732393	575	2.759667	610	2.785329
541	2.733197	576	2.760422	611	2.786041
542	2.733999	577	2.761175	612	2.786751
543	2.734799	578	2.761927	613	2.787460
544	2.735598	579	2.762678	614	2.788168
545	2.736396	580	2.763428	615	2.788875
546	2.737192	581	2.764176	616	2.789580
547	2.737987	582	2.764923	617	2.790285
548	2.738780	583	2.765668	618	2.790988
549	2.739572	584	2.766412	619	2.791690
550	2.740362	585	2.767155	620	2.792391
551	2.741151	586	2.767897	621	2.793091
552	2.741939	587	2.768638	622	2.793790
553	2.742725	588	2.769377	623	2.794488
554	2.743509	589	2.770115	624	2.795184
555	2.744293	590	2.770852	625	2.795880
556	2.745074	591	2.771587	626	2.796574
557	2.745855	592	2.772321	627	2.797267
558	2.746634	593	2.773054	628	2.797959
559	2.747412	594	2.773786	629	2.798651
560	2.748188	595	2.774516	630	2.799341

Num	Logarithm	Num	Logarithm	Num	Logarithm
631	2.800029	666	2.823474	701	2.845718
632	2.800717	667	2.824125	702	2.846357
633	2.801403	668	2.824776	703	2.846995
634	2.802089	669	2.825426	704	2.847572
635	2.802773	670	2.826074	705	2.848180
636	2.803457	671	2.826722	706	2.848804
637	2.804139	672	2.827369	707	2.849419
638	2.804820	673	2.828015	708	2.850033
639	2.805500	674	2.828659	709	2.850246
640	2.806180	675	2.829302	710	2.851658
641	2.806858	676	2.829946	711	2.851269
642	2.807535	677	2.830588	712	2.852480
643	2.808211	678	2.831229	713	2.853089
644	2.808885	679	2.831869	714	2.853698
645	2.809559	680	2.832508	715	2.854206
646	2.810232	681	2.833147	716	2.854913
647	2.810904	682	2.833784	717	2.855519
648	2.811575	683	2.834420	718	2.856124
649	2.812244	684	2.835056	719	2.856728
650	2.812913	685	2.835690	720	2.857332
651	2.813581	686	2.836324	721	2.857935
652	2.814247	687	2.836956	722	2.858537
653	2.814913	688	2.837588	723	2.859138
654	2.815577	689	2.838219	724	2.859738
655	2.816241	690	2.838849	725	2.860338
656	2.816903	691	2.839478	726	2.860936
657	2.817565	692	2.840106	727	2.861534
658	2.818225	693	2.840733	728	2.862131
659	2.818885	694	2.841359	729	2.862727
660	2.819543	695	2.841984	730	2.863322
661	2.820201	696	2.842609	731	2.863917
662	2.820858	697	2.843232	732	2.864511
663	2.821513	698	2.843855	733	2.865104
664	2.822168	699	2.844477	734	2.865696
665	2.822821	700	2.845098	735	2.866287

Num	Logarithm	Num	Logarithm	Num	Logarithm
736	2.866877	771	2.887054	806	2.906335
737	2.867467	772	2.887617	807	2.906873
738	2.868056	773	2.888179	808	2.907411
739	2.868644	774	2.888741	809	2.907948
740	2.869231	775	2.889301	810	2.908485
741	2.869818	776	2.889861	811	2.909020
742	2.870403	777	2.890421	812	2.909556
743	2.870988	778	2.890979	813	2.910090
744	2.871572	779	2.891537	814	2.910624
745	2.872156	780	2.892094	815	2.911157
746	2.872738	781	2.892651	816	2.911690
747	2.873320	782	2.893206	817	2.912222
748	2.873901	783	2.893761	818	2.912753
749	2.874481	784	2.894316	819	2.913285
750	2.875061	785	2.894869	820	2.913813
751	2.875639	786	2.895422	821	2.914343
752	2.876217	787	2.895974	822	2.914871
753	2.876795	788	2.896526	823	2.915399
754	2.877371	789	2.897077	824	2.915927
755	2.877946	790	2.897627	825	2.916453
756	2.878521	791	2.898176	826	2.916980
757	2.879095	792	2.898725	827	2.917505
758	2.879669	793	2.899273	828	2.918030
759	2.880241	794	2.899820	829	2.918554
760	2.880813	795	2.900367	830	2.919078
761	2.881384	796	2.900913	831	2.919601
762	2.881955	797	2.901458	832	2.920123
763	2.882524	798	2.902002	833	2.920645
764	2.883093	799	2.902546	834	2.921166
765	2.883661	800	2.903090	835	2.921686
766	2.884228	801	2.903632	836	2.922206
767	2.884795	802	2.904174	837	2.922725
768	2.885361	803	2.904715	838	2.923244
769	2.885926	804	2.905256	839	2.923762
770	2.886490	805	2.905796	840	2.924279

Num	Logarithm	Num	Logarithm	Num	Logarithm
841	2.924796	876	2.942504	911	2.959118
842	2.925313	877	2.942999	912	2.959594
843	2.925827	878	2.943494	913	2.960070
844	2.926342	879	2.943988	914	2.960546
845	2.926856	880	2.944482	915	2.961021
846	2.927370	881	2.944975	916	2.961495
847	2.927883	882	2.945468	917	2.961969
848	2.928395	883	2.945960	918	2.962442
849	2.928907	884	2.946452	919	2.962915
850	2.929418	885	2.946943	920	2.963387
851	2.929929	886	2.947433	921	2.963859
852	2.930439	887	2.947923	922	2.964330
853	2.930949	888	2.948413	923	2.964801
854	2.931457	889	2.948901	924	2.965272
855	2.931966	890	2.949390	925	2.965741
856	2.932473	891	2.949877	926	2.966211
857	2.932980	892	2.950364	927	2.966679
858	2.933487	893	2.950851	928	2.967148
859	2.933993	894	2.951337	929	2.967616
860	2.934498	895	2.951823	930	2.968082
861	2.935003	896	2.952308	931	2.968549
862	2.935507	897	2.952792	932	2.969015
863	2.936010	898	2.953276	933	2.969481
864	2.936513	899	2.953759	934	2.970347
865	2.937016	900	2.954242	935	2.970811
866	2.937517	901	2.954724	936	2.971275
867	2.938019	902	2.955206	937	2.971739
868	2.938119	903	2.955687	938	2.972205
869	2.939019	904	2.956168	939	2.972665
870	2.939519	905	2.956648	940	2.973127
871	2.940018	906	2.957128	941	2.973589
872	2.940516	907	2.957607	942	2.974050
873	2.941014	908	2.958085	943	2.974511
874	2.941511	909	2.958563	944	2.974972
875	2.942008	910	2.959041	94	2.975431

Num	Logarithm	Num	Logarithm	Num	Logarithm
946	2.975891	981	2.991609	1016	3.006893
947	2.976350	982	2.992111	1017	3.007320
948	2.976808	983	2.992553	1018	3.007747
949	2.977266	984	2.992995	1019	3.008174
950	2.977723	985	2.993436	1020	3.008600
951	2.978180	986	2.993876	1021	3.009025
952	2.978636	987	2.994317	1022	3.009450
953	2.979092	988	2.994756	1023	3.009875
954	2.979548	989	2.995195	1024	3.010299
955	2.980003	990	2.995635	1025	3.010723
956	2.980457	991	2.996073	1026	3.011147
957	2.980911	992	2.996511	1027	3.011570
958	2.981365	993	2.996949	1028	3.011993
959	2.981818	994	2.997386	1029	3.012415
960	2.982271	995	2.997823	1030	3.012837
961	2.982723	996	2.998259	1031	3.013258
962	2.983175	997	2.998695	1032	3.013679
963	2.983626	998	2.999130	1033	3.014100
964	2.984077	999	2.999565	1034	3.014520
965	2.984527	1000	3.000000	1035	3.014940
966	2.984977	1001	3.000434	1036	3.015359
967	2.985426	1002	3.000867	1037	3.015778
968	2.985875	1003	3.001300	1038	3.016197
969	2.986323	1004	3.001733	1039	3.016615
970	2.986771	1005	3.002166	1040	3.017033
971	2.987219	1006	3.002598	1041	3.017450
972	2.987666	1007	3.003029	1042	3.017867
973	2.988112	1008	3.003460	1043	3.018284
974	2.988558	1009	3.003890	1044	3.018700
975	2.989004	1010	3.004321	1045	3.019116
976	2.989449	1011	3.004751	1046	3.019531
977	2.989894	1012	3.005180	1047	3.019946
978	2.990338	1013	3.005609	1048	3.020361
979	2.990782	1014	3.006037	1049	3.020775
980	2.991226	1015	3.006466	1050	3.021189

Num	Logarithm	Num	Logarithm	Num	Logarithm
1051	3.021602	1086	3.035819	1121	3.049605
1052	3.021615	1087	3.036219	1122	3.049992
1053	3.021728	1088	3.036628	1123	3.050379
1054	3.021840	1089	3.037027	1124	3.050766
1055	3.021952	1090	3.037246	1125	3.051152
1056	3.023663	1091	3.037824	1126	3.051538
1057	3.024075	1092	3.038222	1127	3.051923
1058	3.024485	1093	3.038620	1128	3.052309
1059	3 024596	1094	3.039017	1129	3.052693
1060	3.025301	1095	3.039414	1130	3.053078
1061	3.025715	1096	3.039810	1131	3.053462
1062	3.026124	1097	3.040206	1132	3.053846
1063	3.026533	1098	3.040602	1133	3.054229
1064	3.026941	1099	3.040997	1134	3.054613
1065	3.027349	1100	3.041392	1135	3.054995
1066	3.027757	1101	3.041787	1136	3.055378
1067	3.028164	1102	3.042181	1137	3.055760
1068	3.028571	1103	3.042575	1138	3.056142
1069	3.028977	1104	3.042969	1139	3.056523
1070	3.029383	1105	3.043361	1140	3.056904
1071	3.029789	1106	3.043755	1141	3.057285
1072	3.030194	1107	3.044147	1142	3.057666
1073	3 030509	1108	3.044539	1143	3.058046
1074	3 03 004	1109	3.044931	1144	3.058426
1075	3.031405	1100	3.045323	1145	3.058805
1076	3.031812	1111	3.045714	1146	3.059184
1077	3.032215	1112	3.046104	1147	3.059563
1078	3.032618	1113	3.046495	1148	3.0 9941
1079	3.033021	1114	3.046885	1149	3.060320
1080	3.033423	1115	3.047274	1150	3.060697
1081	3.033825	1116	3.047664	1151	3.061075
1082	3.034227	1117	3.048053	1152	3.061452
1083	3.034628	1118	3.048441	1153	3.061829
1084	3.035029	1119	3.048830	1154	3.062205
1085	3.035429	1120	3.049218	1155	3.062582

Num	Logarithm	Num	Logarithm	Num	Logarithm
1156	3.062957	1191	3.075911	1226	3.088490
1157	3.063333	1192	3.076276	1227	3.088844
1158	3.063703	1193	3.076644	1228	3.089198
1159	3.064083	1194	3.077000	1229	3.089551
1160	3.064458	1195	3.077367	1230	3.089905
1161	3.064832	1196	3.077731	1231	3.090258
1162	3.065206	1197	3.078094	1232	3.090610
1163	3.065579	1198	3.078456	1233	3.090963
1164	3.065953	1199	3.078819	1234	3.091315
1165	3.066325	1200	3.079181	1235	3.091686
1166	3.066698	1201	3.079543	1236	3.092018
1167	3.067070	1202	3.079904	1237	3.092369
1168	3.067442	1203	3.080265	1238	3.092720
1169	3.067814	1204	3.080626	1239	3.093071
1170	3.068185	1205	3.080987	1240	3.093421
1171	3.068556	1206	3.081347	1231	3.093771
1172	3.068927	1207	3.081707	1232	3.094121
1173	3.069298	1208	3.082066	1233	3.094471
1174	3.069668	1209	3.082426	1234	3.094820
1175	3.070037	1210	3.082785	1245	3.095169
1176	3.070407	1211	3.083144	1246	3.095518
1177	3.070776	1212	3.083502	1247	3.095866
1178	3.071145	1213	3.083860	1248	3.096214
1179	3.071513	1214	3.084218	1249	3.096562
1180	3.071882	1215	3.084576	1250	3.096910
1181	3.072249	1216	3.084933	1251	3.097257
1182	3.072617	1217	3.085290	1252	3.097604
1183	3.072984	1218	3.085647	1253	3.097951
1184	3.073351	1219	3.086003	1254	3.098297
1185	3.073718	1220	3.086359	1255	3.098642
1186	3.074084	1221	3.086715	1256	3.098989
1187	3.074450	1222	3.087071	1257	3.099335
1188	3.074816	1223	3.087426	1258	3.099680
1189	3.075181	1224	3.087781	1259	3.000025
1180	3.075547	1225	3.088136	1260	3.000370

Num	Logarithm	Num	Logarithm	Num	Logarithm
1261	3.100715	1296	3.112605	1331	3.124178
1262	3.101039	1297	3.112940	1332	3.124504
1263	3.101403	1298	3.113274	1333	3.124830
1264	3.101747	1299	3.113609	1334	3.125155
1265	3.102090	1300	3.113943	1335	3.125481
1266	3.102433	1301	3.114277	1336	3.125806
1267	3.102776	1302	3.114611	1337	3.126131
1268	3.103119	1303	3.114944	1338	3.126456
1269	3 103461	1304	3.115277	1339	3.126780
1270	3.103803	1305	3.115610	1340	3.127104
1271	3.104145	1306	3.115943	1341	3.127428
1272	3.104487	1307	3.116275	1342	3.127751
1273	3.104828	1308	3.116607	343	3 128076
1274	3.105169	1309	3.116939	1344	3.128399
1275	3.105510	1310	3.117271	1345	3.128722
1276	3.105850	1311	3.117602	1346	3.129045
1277	3.106190	1312	3.117933	1347	3.129367
1278	3.106530	1313	3.118264	1348	3.129689
1279	3.106870	1314	3.118595	1349	3.130010
1280	3.107210	1315	3.118925	1350	3.130331
1281	3.107549	1316	3.119255	1351	3.130655
1282	3.107888	1317	3.119585	1352	3.130976
1283	3.108226	1318	3.119915	1353	3.131297
1284	3.108565	1319	3.120244	1354	3.131618
1285	3.108903	1320	3.120573	1355	3.131939
1286	3.109241	1321	3.120902	1356	3.132259
1287	3.109578	1322	3.121231	1357	3.132579
1288	3.109915	1323	3.121559	1358	3.132899
1289	3.110252	1324	3.121888	1359	3.133219
1290	3.110589	1325	3.122215	1360	3.133538
1291	3.110926	1326	3.122543	1361	3.133858
1292	3.111262	1327	3.122870	1362	3.134177
1293	3.111598	1328	3.123198	1363	3.134495
1294	3.111934	1329	3.123525	1364	3.134814
1295	3.112269	1330	3.123851	1365	3.135132

Num	Logaritbm	Num	Logaritbm	Num	Logaritbm
1366	3.132450	1401	3.146438	1436	3.157154
1367	3.133768	1402	3.146748	1437	3.157456
1368	3.136086	1403	3.147057	1438	3.157758
1369	3.136404	1404	3.147367	1439	3.158060
1370	3.136720	1405	3.147676	1440	3.158362
1371	3.137037	1406	3.147985	1441	3.158664
1372	3.137354	1407	3.148294	1442	3.158965
1373	3.137670	1408	3.148602	1443	3.159266
1374	3.137986	1409	3.148911	1444	3.159567
1375	3.138302	1410	3.149219	1445	3.159867
1376	3.138618	1411	3.149527	1446	3.160168
1377	3.138933	1412	3.149834	1447	3.160468
1378	3.139249	1413	3.150142	1448	3.160768
1379	3.139564	1414	3.150449	1449	3.161068
1380	3.139879	1415	3.150756	1450	3.161368
1381	3.140193	1416	3.151063	1451	3.161667
1382	3.140508	1417	3.151369	1452	3.161968
1383	3.140822	1418	3.151676	1453	3.162265
1384	3.141136	1419	3.151982	1454	3.162563
1385	3.141449	1420	3.152288	1455	3.162863
1386	3.141763	1421	3.152594	1456	3.163161
1387	3.142076	1422	3.152899	1457	3.163459
1388	3.142389	1423	3.153204	1458	3.163757
1389	3.142702	1424	3.153510	1459	3.164055
1390	3.143014	1425	3.153814	1460	3.164352
1391	3.143327	1426	3.154119	1461	3.164650
1392	3.143639	1427	3.154424	1462	3.164941
1393	3.143951	1428	3.154728	1463	3.165244
1394	3.144262	1429	3.155032	1464	3.165541
1395	3.144574	1430	3.155776	1465	3.165837
1396	31.44885	1431	3.155639	1466	3.166134
1397	31.45196	1432	3.155943	1467	3.166430
1398	31.45407	1433	3.156246	1468	3.166726
1399	31.45817	1434	3.156549	1469	3.167021
1400	31.46128	1435	3.156851	1470	3.167317

Num	Logarithmi	Num	Logarithmi	Num	Logarithmi
1471	3.167612	1506	3.177825	1541	3.187[illegible]
1472	3.167907	1507	3.178113	1542	3.188[illegible]
1473	3.168201	1508	3.178401	1543	3.188[illegible]
1474	3.168497	1509	3.178689	1544	3.188647
1475	3.168792	1510	3.178976	1545	3.188[illegible]
1476	3.169086	1511	3.179264	1546	3.189205
1477	3.169380	1512	3.179551	1547	3.189490
1478	3.169674	1513	3.179838	1548	3.189776
1479	3.169968	1514	3.180145	1549	3.190062
1480	3.170261	1515	3.180412	1550	3.190331
1481	3.170555	1516	3.180699	1551	3.190611
1482	3.170848	1517	3.180985	1552	3.190897
1483	3.171141	1518	3.181271	1553	3.191171
1484	3.171433	1519	3.181557	1554	3.191451
1485	3.171726	1520	3.181843	1555	3.191730
1486	3.172018	1521	3.182129	1556	3.192009
1487	3.172311	1522	3.182414	1557	3.192288
1488	3.172602	1523	3.182699	1558	3.192564
1489	3.172894	1524	3.182985	1559	3.192840
1490	3.173186	1525	3.183269	1560	3.193124
1491	3.173477	1526	3.183554	1561	3.193402
1492	3.173768	1527	3.183839	1562	3.193681
1493	3.174059	1528	3.184123	1563	3.193959
1494	3.174350	1529	3.184407	1564	3.194236
1495	3.174641	1530	3.184691	1575	3.194514
1496	3.174931	1531	3.184975	1576	3.194791
1497	3.175221	1532	3.185258	1577	3.195069
1498	3.175511	1533	3.185542	1578	3.195346
1499	3.175801	1534	3.185835	1579	3.195622
1450	3.176091	1575	3.186108	1570	3.195899
1451	3.176380	1536	3.186391	1571	3.196176
1452	3.176669	1537	3.186673	1572	3.196451
1453	3.176959	1538	3.186956	1573	3.196728
1454	3.177247	1539	3.187236	1574	3.197004
1455	3.177536	1540	3.187520	1575	3.197280

Num	Logaritha	Num	Logaritha	Num	Logaritha
1576	3.197556	1611	3.207995	1646	3.216287
1577	3.197831	1612	3.207367	1647	3.216593
1578	3.198107	1613	3.207634	1648	3.216899
1579	3.198382	1614	3.207903	1649	3.217120
1580	3.198657	1615	3.208172	1650	3.217481
1581	3.198931	1616	3.208441	1651	3.217747
1582	3.199206	1617	3.208710	1652	3.218010
1583	3.199480	1618	3.208978	1653	3.218272
1584	3.199755	1619	3.209246	1654	3.218535
1585	3.200029	1620	3.209515	1655	3.218798
1586	3.200303	1621	3.209783	1656	3.219060
1587	3.200576	1622	3.210050	1657	3.219322
1588	3.200850	1623	3.210318	1658	3.219584
1589	3.201123	1624	3.210586	1659	3.219846
1590	3.201397	1625	3.210853	1660	3.220108
1591	3.201670	1626	3.211120	1661	3.220369
1592	3.201943	1627	3.211387	1662	3.220631
1593	3.202215	1628	3.211654	1663	3.220892
1594	3.202488	1629	3.211921	1664	3.221153
1595	3.202760	1630	3.212187	1665	3.221414
1596	3.203032	1631	3.212454	1666	3.221675
1597	3.203304	1632	3.212720	1667	3.221935
1598	3.203576	1633	3.212982	1668	3.222196
1599	3.203848	1634	3.213252	1669	3.222456
1600	3.204120	1635	3.213517	1670	3.222716
1601	3.204391	1636	3.213783	1671	3.222976
1602	3.204662	1637	3.214048	1672	3.223236
1603	3.204933	1638	3.214313	1673	3.223495
1604	3.205204	1639	3.214578	1674	3.223755
1605	3.205475	1640	3.214843	1675	3.224014
1606	3.205745	1641	3.215108	1676	3.224274
1607	3.206015	1642	3.215373	1677	3.224533
1608	3.206286	1643	3.215637	1678	3.224792
1609	3.206556	1644	3.215901	1679	3.225050
1610	3.206825	1645	3.216165	1680	3.225309

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
1681	3.226387	1716	3.234517	1751	3.243286
1682	3.226826	1717	3.234770	1752	3.243534
1683	3.226984	1718	3.235023	1753	3.243781
1684	3.226342	1719	3.235275	1754	3.244029
1685	3.226599	1720	3.235528	1755	3.244277
1686	3.226857	1721	3.235780	1756	3.244524
1687	3.227117	1722	3.236033	1757	3.244771
1688	3.227372	1723	3.236285	1758	3.245018
1689	3.227629	1724	3.236537	1759	3.245265
1690	3.227886	1725	3.236789	1760	3.245512
1691	3.228143	1726	3.237040	1761	3.245759
1692	3.228400	1727	3.237292	1762	3.246005
1693	3.228657	1728	3.237543	1763	3.246252
1694	3.228913	1729	3.237795	1764	3.246498
1695	3.229169	1730	3.238046	1765	3.246744
1696	3.229425	1731	3.238297	1766	3.246990
1697	3.229681	1732	3.238547	1767	3.247236
1698	3.229937	1733	3.238798	1768	3.247482
1699	3.230193	1734	3.239049	1769	3.247727
1700	3.230448	1735	3.239299	1770	3.247973
1701	3.230704	1736	3.239549	1771	3.248218
1702	3.230959	1737	3.239799	1772	3.248463
1703	3.231214	1738	3.240049	1773	3.248708
1704	3.231469	1739	3.240299	1774	3.248953
1705	3.231725	1740	3.240549	1775	3.249198
1706	3.231979	1741	3.240798	1771	3.249443
1707	3.232233	1742	3.241048	1772	3.249687
1708	3.232487	1743	3.241297	1773	3.249931
1709	3.232742	1744	3.241546	1774	3.250175
1710	3.232996	1745	3.241795	1785	3.250420
1711	3.233250	1746	3.242044	1786	3.250663
1712	3.233503	1747	3.242292	1787	3.250907
1713	3.233757	1748	3.242541	1788	3.251151
1714	3.234010	1749	3.242789	1789	3.251394
1715	3.234264	1750	3.243038	1780	3.251638

Num	Logarithm	Num	Logarithm	Num	Logarithm
1786	3.251881	1821	3.260309	1856	3.268578
1787	3.252124	1822	3.260548	1857	3.268811
1788	3.252367	1823	3.260786	1858	3.269045
1789	3.252610	1824	3.261024	1859	3.269279
1790	3.252853	1825	3.261262	1860	3.269512
1791	3.253095	1826	3.261500	1861	3.269746
1792	3.253338	1827	3.261738	1862	3.269979
1793	3.253580	1828	3.261976	1863	3.270212
1794	3.253822	1829	3.262213	1864	3.270445
1795	3.254064	1830	3.262451	1865	3.270678
1796	3.254306	1831	3.262688	1866	3.270911
1797	3.254548	1832	3.262925	1867	3.271144
1798	3.254789	1833	3.263161	1868	3.271376
1799	3.255031	1834	3.263399	1869	3.271609
1800	3.255272	1835	3.263636	1870	3.271841
1801	3.255513	1836	3.263872	1871	3.272073
1802	3.255754	1837	3.264109	1872	3.272305
1803	3.255995	1838	3.264345	1873	3.272537
1804	3.256236	1839	3.264581	1874	3.272769
1805	3.256477	1840	3.264817	1875	3.273001
1806	3.256717	1841	3.265053	1876	3.273232
1807	3.256958	1842	3.265289	1877	3.273464
1808	3.257198	1843	3.265525	1878	3.273695
1809	3.257438	1844	3.265760	1879	3.273926
1810	3.257678	1845	3.265996	1880	3.274157
1811	3.257918	1846	3.266231	1881	3.274388
1812	3.258158	1847	3.266466	1882	3.274619
1813	3.258397	1848	3.266702	1883	3.274850
1814	3.258637	1849	3.266936	1884	3.275080
1815	3.258876	1850	3.267171	1885	3.275311
1816	3.259115	1851	3.267406	1886	3.275541
1817	3.259354	1852	3.267641	1887	3.275771
1818	3.259593	1853	3.267875	1888	3.276002
1819	3.259832	1854	3.268109	1889	3.276232
1820	3.260071	1855	3.268343	1890	3.276461

Num	Logarithm	Num	Logarithm	Num	Logarithm
1891	3.276691	1916	3.284656	1961	3.292477
1892	3.276921	1917	3.284881	1962	3.292698
1893	3.277150	1918	3.285107	1963	3.292920
1894	3.277380	1919	3.285332	1964	3.293141
1895	3.277609	1920	3.285557	1965	3.293362
1896	3.277838	1931	3.285782	1966	3.293583
1897	3.278067	1932	3.286007	1967	3.293804
1898	3.278296	1933	3.286231	1968	3.294025
1899	3.278525	1934	3.286456	1969	3.294245
1900	3.278752	1935	3.286681	1970	3.294466
1901	3.278982	1936	3.286905	1971	3.294686
1902	3.279210	1937	3.287129	1972	3.294906
1903	3.279438	1938	3.287353	1973	3.295127
1904	3.279666	1939	3.287577	1974	3.295347
1905	3.279895	1940	3.287801	1975	3.295567
1906	3.280122	1941	3.288025	1976	3.295786
1907	3.280350	1942	3.288249	1977	3.296006
1908	3.280578	1943	3.288472	1978	3.296226
1909	3.280805	1944	3.288699	1979	3.296445
1910	3.281003	1945	3.288916	1980	3.296665
1911	3.281260	1946	3.289141	1981	3.296884
1912	3.281487	1947	3.289365	1982	3.297103
1913	3.281715	1948	3.289588	1983	3.297322
1914	3.281941	1949	3.289811	1984	3.297541
1915	3.282168	1950	3.290034	1985	3.297760
1916	3.282395	1951	3.290257	1986	3.297979
1917	3.282622	1952	3.290479	1987	3.298197
1918	3.282848	1953	3.290702	1988	3.298416
1919	3.283075	1954	3.290924	1989	3.298631
1920	3.283301	1955	3.291146	1990	3.298853
1921	3.283527	1956	3.291368	1991	3.299071
1922	3.283753	1957	3.291590	1992	3.299289
1923	3.283979	1958	3.291812	1993	3.299507
1924	3.284205	1959	3.292034	1994	3.299725
1925	3.284430	1960	3.292256	1995	3.299942

Num	Logarithm	Num	Logarithm	Num	Logarithm
1996	3.300160	2031	3.307709	2066	3.315130
1997	3.300378	2032	3.307923	2067	3.315340
1998	3.300595	2033	3.308137	2068	3.315550
1999	3.300812	2034	3.308350	2069	3.315760
2000	3.301030	2035	3.308564	2070	3.315970
2001	3.301247	2036	3.308777	2071	3.316180
2002	3.301464	2037	3.308991	2072	3.316389
2003	3.301680	2038	3.309204	2073	3.316599
2004	3.301897	2039	3.309417	2074	3.316808
2005	3.302114	2040	3.309630	2075	3.317018
2006	3.302330	2041	3.309843	2076	3.317227
2007	3.302547	2042	3.310055	2077	3.317436
2008	3.302763	2043	3.310268	2078	3.317645
2009	3.302979	2044	3.310480	2079	3.317854
2010	3.303196	2045	3.310693	2080	3.318063
2011	3.303412	2046	3.310905	2081	3.318272
2012	3.303628	2047	3.311117	2082	3.318480
2013	3.303843	2048	3.311329	2083	3.318689
2014	3.304059	2049	3.311542	2084	3.318897
2015	3.304275	2050	3.311753	2085	3.319106
2016	3.304490	2051	3.311965	2086	3.319314
2017	3.304705	2052	3.312177	2087	3.319522
2018	3.304921	2053	3.312388	2088	3.319730
2019	3.305136	2054	3.312600	2089	3.319938
2020	3.305351	2055	3.312811	2090	3.320146
2021	3.305566	2056	3.313023	2091	3.320354
2022	3.305781	2057	3.313234	2092	3.320561
2023	3.305995	2058	3.313445	2093	3.320769
2024	3.306210	2059	3.313656	2094	3.320976
2025	3.306425	2060	3.313867	2095	3.321184
2026	3.306639	2061	3.314078	2096	3.321391
2027	3.306853	2062	3.314288	2097	3.321598
2028	3.307067	2063	3.314499	2098	3.321805
2029	3.307282	2064	3.314709	2099	3.322011
2030	3.307496	2065	3.314920	2100	3.322219

Num	Logarithm	Num	Logarithm	Num	Logarithm
2101	3.3224.6	2136	3.3296o1	2171	3.3366[illegible]9
2102	3.3226632	2137	3.329804	2172	3.3368[illegible]9
2103	3.3228639	2138	3.3300007	2173	3.3370[illegible]9
2104	3.3230[illegible]5	2139	3.3302[illegible]0	2174	3.3372[illegible]9
2105	3.3232[illegible]2	2140	3.3304[illegible]3	2175	3.3374[illegible]9
2106	3.3234458	2141	3.3306[illegible]6	2176	3.3376[illegible]8
2107	3.3236664	2142	3.3308[illegible]9	2177	3.3378[illegible]8
2108	3.3238[illegible]70	2143	3.3310[illegible]22	2178	3.3380[illegible]7
2109	3.3240[illegible]75	2144	3.3312[illegible]24	2179	3.3382[illegible]57
2110	3.3242[illegible]81	2145	3.3314[illegible]27	2180	3.3384[illegible]56
2111	3.3244[illegible]88	2146	3.3316[illegible]29	2181	3.3386[illegible]55
2112	3.3246693	2147	3.3318832	2182	3.3388[illegible]54
2113	3.3248[illegible]99	2148	3.3320[illegible]34	2183	3.3390[illegible]53
2114	3.3251[illegible]05	2149	3.3322[illegible]36	2184	3.3392[illegible]52
2115	3.3253[illegible]10	2150	3.3324[illegible]38	2185	3.3394[illegible]51
2116	3.3255515	2151	3.3326[illegible]40	2186	3.3396[illegible]50
2117	3.3257720	2152	3.3328[illegible]42	2187	3.3398[illegible]48
2118	3.3259926	2153	3.3330[illegible]44	2188	3.3400[illegible]47
2119	3.3262131	2154	3.3332[illegible]45	2189	3.3402[illegible]45
2120	3.3264336	2155	3.3334[illegible]47	2180	3.3404[illegible]44
2121	3.3266540	2156	3.3336[illegible]48	2191	3.3406[illegible]42
2122	3.3268745	2157	3.3338[illegible]50	2192	3.3408[illegible]40
2123	3.3270950	2158	3.3340[illegible]51	2193	3.3410[illegible]37
2124	3.3273154	2159	3.3342[illegible]52	2194	3.3412[illegible]36
2125	3.3275358	2160	3.3344[illegible]53	2195	3.3414[illegible]34
2126	3.3277563	2161	3.3346[illegible]54	2196	3.3416[illegible]32
2127	3.3279767	2162	3.3348[illegible]55	2197	3.3418[illegible]30
2128	3.3281971	2163	3.3350[illegible]56	2198	3.3420[illegible]26
2129	3.3284175	2164	3.3352[illegible]57	2199	3.3422[illegible]25
2130	3.3286379	2165	3.3354[illegible]57	2200	3.3424[illegible]22
2131	3.3288583	2196	3.3356[illegible]58	2201	3.3426[illegible]20
2132	3.3290787	2167	3.3358[illegible]58	2202	3.3428[illegible]17
2133	3.3292990	2168	3.3360[illegible]59	2203	3.3430[illegible]14
2134	3.3295194	2169	3.3362[illegible]59	2204	3.3432[illegible]21
2135	3.3297397	2170	3.3364[illegible]59	2205	3.3434[illegible]08

Num	Logarithm	Num	Logarithm	Num	Logarithm
2206	3.343601	2241	3.350441	2276	3.357178
2207	3.343802	2242	3.350635	2277	3.357363
2208	3.343999	2243	3.350829	2278	3.357553
2209	3.344195	2244	3.351021	2279	3.357744
2210	3.344392	2245	3.351216	2280	3.357934
2211	3.344588	2246	3.351409	2281	3.358125
2212	3.344785	2247	3.351603	2282	3.358315
2213	3.344981	2248	3.351796	2283	3.358505
2214	3.345177	2249	3.351989	2284	3.358696
2215	3.345373	2250	3.352182	2285	3.358885
2216	3.345569	2251	3.352375	2286	3.359076
2217	3.345765	2252	3.352568	2287	3.359266
2218	3.345961	2253	3.352761	2288	3.359456
2219	3.346157	2254	3.352953	2289	3.359645
2220	3.346353	2255	3.353146	2290	3.359835
2221	3.346548	2256	3.353339	2291	3.360025
2222	3.346744	2257	3.353531	2292	3.360214
2223	3.346949	2258	3.353723	2293	3.360404
2224	3.347134	2259	3.353916	2294	3.360593
2225	3.347330	2260	3.354108	2295	3.360782
2226	3.347525	2261	3.354300	2296	3.360971
2227	3.347720	2262	3.354492	2297	3.361161
2228	3.347915	2263	3.354684	2298	3.361350
2229	3.348110	2264	3.354876	2299	3.361539
2230	3.348304	2265	3.355068	2300	3.361727
2231	3.348499	2266	3.355259	2301	3.361916
2232	3.348694	2267	3.355451	2302	3.362105
2233	3.348888	2268	3.355643	2303	3.362293
2234	3.349083	2269	3.355834	2304	3.362482
2235	3.349277	2270	3.356025	2305	3.362670
2236	3.349471	2271	3.356217	2306	3.362859
2237	3.349666	2272	3.356408	2307	3.363047
2238	3.349860	2273	3.356599	2308	3.363235
2239	3.350054	2274	3.356790	2309	3.363423
2240	3.350248	2275	3.356981	2310	3.363611

Num	Logarithus	Num	Logarithus	Num	Logarithus
2311	3.363800	2346	3.370328	2381	3.376799
2312	3.363987	2347	3.370513	2382	3.376941
2313	3.364175	2348	3.370698	2383	3.377124
2314	3.364364	2349	3.370883	2384	3.377307
2315	3.364551	2350	3.371067	2385	3.377488
2316	3.364738	2351	3.371252	2386	3.377670
2317	3.364926	2352	3.371437	2387	3.377852
2318	3.365113	2353	3.371621	2388	3.378034
2319	3.365300	2354	3.371806	2389	3.378216
2320	3.365488	2355	3.371990	2390	3.378397
2321	3.365675	2356	3.372175	2391	3.378579
2322	3.365862	2357	3.372359	2392	3.378761
2323	3.366049	2358	3.372543	2393	3.378942
2324	3.366236	2359	3.372727	2394	3.379124
2325	3.366423	2360	3.372912	2395	3.379305
2326	3.366609	2361	3.373096	2396	3.379486
2327	3.366796	2362	3.373279	2397	3.379668
2328	3.366983	2363	3.373463	2398	3.379849
2329	3.367169	2364	3.373647	2399	3.380030
2330	3.367355	2365	3.373831	2400	3.380211
2331	3.367542	2366	3.374014	2401	3.380392
2332	3.367728	2367	3.374198	2402	3.380573
2333	3.367914	2368	3.374381	2403	3.380753
2334	3.368100	2369	3.374565	2404	3.380934
2335	3.368286	2370	3.374748	2405	3.381115
2336	3.368472	2371	3.374931	2406	3.381295
2337	3.368658	2372	3.375114	2407	3.381476
2338	3.368844	2373	3.375297	2408	3.381656
2339	3.369030	2374	3.375480	2409	3.381836
2340	3.369215	2375	3.375663	2410	3.382017
2341	3.369401	2376	3.375846	2411	3.382197
2342	3.369586	2377	3.376029	2412	3.382377
2343	3.369772	2378	3.376211	2413	3.382557
2344	3.369957	2379	3.376394	2414	3.382737
2345	3.370142	2380	3.376576	2415	3.382917

Num	Logarithm	Num	Logarithm	Num	Logarithm
2416	3.383096	2451	3.389343	2486	3.395501
2417	3.383276	2452	3.389520	2487	3.395675
2418	3.383456	2453	3.389697	2488	3.395850
2419	3.383635	2454	3.389874	2489	3.396024
2420	3.383815	2455	3.390051	2490	3.396199
2421	3.383994	2456	3.390228	2491	3.396373
2422	3.384174	2457	3.390405	2492	3.396548
2423	3.384353	2458	3.390581	2493	3.396722
2424	3.384532	2459	3.390758	2494	3.396896
2425	3.384711	2460	3.390935	2495	3.397070
2426	3.384890	2461	3.391111	2496	3.397244
2427	3.385069	2462	3.391288	2497	3.397418
2428	3.385248	2463	3.391464	2498	3.397592
2429	3.385427	2464	3.391640	2499	3.397766
2430	3.385606	2465	3.391816	2500	3.397940
2431	3.385785	2466	3.391993	2501	3.398113
2432	3.385963	2467	3.392169	2502	3.398287
2433	3.386142	2468	3.392345	2503	3.398460
2434	3.386320	2469	3.392521	2504	3.398634
2435	3.386499	2470	3.392696	2505	3.398807
2436	3.386677	2471	3.392872	2506	3.398981
2437	3.386855	2472	3.393048	2507	3.399154
2438	3.387033	2473	3.393224	2508	3.399327
2439	3.387211	2474	3.393399	2509	3.399500
2440	3.387389	2475	3.393575	2510	3.399673
2441	3.387567	2476	3.393750	2511	3.399846
2442	3.387745	2477	3.393926	2512	3.400019
2443	3.387923	2478	3.394101	2513	3.400192
2444	3.388101	2479	3.394276	2514	3.400365
2445	3.388278	2480	3.394451	2515	3.400538
2446	3.388456	2481	3.394626	2516	3.400710
2447	3.388634	2482	3.394801	2517	3.400883
2448	3.388811	2483	3.394976	2518	3.401055
2449	3.388988	2484	3.395151	2519	3.401228
2450	3.389166	2485	3.395326	2520	3.401402

Num	Logarithm	Num	Logarithm	Num	Logarithm
2521	3.401572	2556	3.407560	2591	3.413469
2522	3.401745	2557	3.407730	2592	3.413635
2523	3.401917	2558	3.407900	2593	3.413801
2524	3.402089	2559	3.408070	2594	3.413970
2525	3.40226	2560	2.408240	2595	3.414137
2526	3.402433	2561	3.408409	2596	3.414304
2527	3.402605	2562	3.408579	2597	3.414472
2528	3.402777	2563	3.408748	2598	3.414639
2529	3.402948	2564	3.408918	2599	3.414806
2530	3.403120	2565	3.409087	2600	3.414973
2531	3.403292	2566	3.409256	2601	3.415140
2532	3.403463	2567	3.409425	2602	3.415307
2533	3.403635	2568	3.409595	2603	3.415474
2534	3.403806	2569	3.409764	2604	3.415641
2535	3.403978	2570	3.409933	2605	3.415807
2536	3.404149	2571	3.410102	2606	3.415974
2537	3.404320	2572	3.410271	2607	3.416141
2538	3.404491	2573	3.410439	2608	3.416307
2539	3.404662	2574	3.410608	2609	3.416474
2540	3.404832	2575	2.410777	2610	3.416640
2541	3.405004	2576	3.410945	2611	3.416806
2542	3.405175	2577	3.411114	2612	3.416973
2543	3.405346	2578	3.411282	2613	3.417139
2544	3.405517	2579	3.411451	2614	3.417305
2545	3.405687	2580	3.411619	2615	3.417471
2546	3.405858	2581	3.411788	2616	3.417637
2547	3.406028	2582	3.411956	2617	3.417803
2548	3.406199	2583	3.412124	2618	3.417969
2549	3.406369	2584	3.412292	2619	3.418135
2550	3.406540	2585	3.412460	2620	3.418301
2551	3.406710	2586	3.412627	2621	3.418467
2553	3.406880	2587	3.412796	2622	3.418632
2553	3.407050	2588	3.412964	2623	3.418798
2554	3.407220	2589	3.413132	2624	3.418963
2555	3.407390	2590	3.413299	2625	3.419129

Num	Logarithm	Num	Logarithm	Num	Logarithm
2626	3.419194	2661	3.423044	2696	3.430719
2627	3.419460	2662	3.423308	2697	3.430880
2628	3.419625	2663	3.423571	2698	3.431041
2629	3.419790	2664	3.423834	2699	3.431202
2630	3.419955	2665	3.424097	2700	3.431363
2631	3.420120	2666	3.424363	2701	3.431524
2632	3.420285	2667	3.424626	2702	3.431685
2633	3.420450	2668	3.424889	2703	3.431846
2634	3.420615	2669	3.425341	2704	3.432006
2635	3.420780	2670	3.425413	2705	3.432167
2636	3.420945	2671	3.425673	2706	3.432327
2637	3.421110	2672	3.425836	2707	3.432488
2638	3.421274	2673	3.426099	2708	3.432648
2639	3.421439	2674	3.426361	2709	3.432809
2640	3.421603	2675	3.426723	2710	3.432969
2641	3.421768	2676	3.426986	2711	3.433129
2642	3.421932	2677	3.427648	2712	3.433289
2643	3.422097	2678	3.427810	2713	3.433449
2644	3.422261	2679	3.427972	2714	3.433609
2645	3.422425	2680	3.428134	2715	3.433769
2646	3.422589	2681	3.428296	2716	3.433929
2647	3.422753	2682	3.428458	2717	3.434089
2648	3.422918	2683	3.428620	2718	3.434249
2649	3.423082	2684	3.428782	2719	3.434409
2650	3.423245	2685	3.428944	2720	3.434568
2651	3.423409	2686	3.429106	2721	3.434728
2652	3.423573	2687	3.429267	2722	3.434888
2653	3.423737	2688	3.429429	2723	3.435047
2654	3.423900	2689	3.429590	2724	3.435207
2655	3.424064	2690	3.429752	2725	3.435366
2656	3.424228	2691	3.429913	2726	3.435525
2657	3.424391	2692	3.430075	2727	3.435685
2658	3.424555	2693	3.430236	2728	3.435844
2659	3.424718	2694	3.430397	2729	3.436003
2660	3.424882	2695	3.430558	2730	3.436162

Num	Logarithm	Num	Logarithm	Num	Logarithm
2731	3.436321	2766	3.441852	2801	3.44735
2732	3.436480	2767	3.442009	2802	3.44749
2733	3.436639	2768	3.442166	2803	3.44764
2734	3.436798	2769	3.442322	2804	3.44779
2735	3.436957	2770	3.442479	2805	3.44795
2736	3.437116	2771	3.442636	2806	3.44810
2737	3.437274	2772	3.442793	2807	3.44824
2738	3.437433	2773	3.442949	2808	3.44839
2739	3.437592	2774	3.443106	2809	3.44855
2740	3.437750	2775	3.443263	2810	3.44870
2741	3.437909	2776	3.443419	2811	3.44886
2742	3.438067	2777	3.443575	2812	3.44901
2743	3.438225	2778	3.443732	2813	3.44916
2744	3.438384	2779	3.443888	2814	3.44932
2745	3.438542	2780	3.444044	2815	3.44947
2746	3.438700	2781	3.444201	2816	3.44963
2747	3.438858	2782	3.444357	2817	3.44978
2748	3.439016	2783	3.444513	2818	3.44994
2749	3.439174	2784	3.444669	2819	3.45009
2750	3.439332	2785	3.444825	2820	3.45024
2751	3.439490	2786	3.444981	2821	3.45040
2752	3.439648	2787	3.445137	2822	3.45055
2753	3.439806	2788	3.445292	2823	3.45071
2754	3.439963	2789	3.445444	2824	3.45086
2755	3.440121	2790	3.445600	2825	3.45101
2756	3.440279	2791	3.445759	2826	3.45117
2757	3.440436	2792	3.445915	2827	3.45132
2758	3.440594	2793	3.446070	2828	3.45147
2759	3.440751	2794	3.446226	2829	3.45163
2760	3.440909	2795	3.446381	2830	3.45178
2761	3.441066	2796	3.446537	2831	3.45193
2762	3.441223	2797	3.446692	2832	3.45209
2763	3.441380	2798	3.446847	2833	3.45224
2764	3.441538	2799	3.447002	2834	3.45239
2765	3.441695	2800	3.447158	2835	3.45255

Num	Logarithm	Num	Logarithm	Num	Logarithm
2836	3.452706	2871	3.458033	2906	3.463195
2837	3.452859	2872	3.458184	2907	3.463345
2838	3.453012	2873	3.458331	2908	3.463594
2839	3.453165	2874	3.458486	2909	3.463743
2840	3.453318	2875	3.458637	2910	3.463891
2841	3.453471	2876	3.458788	2911	3.464041
2842	3.453624	2877	3.458939	2912	3.464191
2843	3.453776	2878	3.459090	2913	3.464340
2844	3.453929	2879	3.459241	2914	3.464489
2845	3.454082	2880	3.459392	2915	3.464638
2846	3.454234	2881	3.459543	2916	3.464787
2847	3.454387	2882	3.459694	2917	3.464936
2848	3.454540	2883	3.459844	2918	3.465085
2849	3.454692	2884	3.459995	2919	3.465234
2850	3.454844	2885	3.460145	2920	3.465382
2851	3.454997	2886	3.460296	2921	3.465531
2852	3.455149	2887	3.460446	2922	3.465680
2853	3.455301	2888	3.460597	2923	3.465828
2854	3.455454	2889	3.460747	2924	3.465977
2855	3.455606	2890	3.460897	2925	3.466125
2856	3.455758	2891	3.461048	2926	3.466274
2857	3.455910	2892	3.461198	2927	3.466422
2858	3.456062	2893	3.461348	2928	3.466571
2859	3.456214	2894	3.461498	2929	3.466719
2860	3.456366	2895	3.461648	2930	3.466867
2861	3.456517	2896	3.461798	2931	3.467015
2862	3.456669	2897	3.461948	2932	3.467164
2863	3.456821	2898	3.462098	2933	3.467312
2864	3.456973	2899	3.462248	2934	3.467460
2865	3.457124	2900	3.462398	2935	3.467608
2866	3.457276	2901	3.462547	2936	3.467756
2867	3.457427	2902	3.462697	2937	3.467903
2868	3.457579	2903	3.462847	2938	3.468051
2869	3.457730	2904	3.462996	2939	3.468199
2870	3.457881	2905	3.463146	2940	3.468347

Num	Logarithm	Num	Logarithm	Num	Logarithm
1941	3.468495	1976	3.473632	3011	3.478757
1942	3.468842	1977	3.473778	3011	3.478904
1943	3.468790	1978	3.473924	3013	3.479050
1944	3.468937	1979	3.474070	3014	3.479196
1945	3.469085	1980	3.474216	3015	3.479342
1946	3.469232	1981	3.474362	3016	3.479488
1947	3.469380	1982	3.474507	3017	3.479634
1948	3.469527	1983	3.474653	3018	3.479780
1949	3.469674	1984	3.474798	3019	3.479926
1950	3.469822	1985	3.474944	3020	3.480072
1951	3.469969	1986	3.475089	3021	3.480150
1952	3.470116	1987	3.475235	3022	3.480364
1953	3.470263	1988	3.475380	3023	3.480510
1954	3.470410	1989	3.475525	3024	3.480581
1955	3.470557	1990	3.475671	3025	3.480727
1956	3.470704	1991	3.475816	3026	3.480873
1957	3.470851	1992	3.475961	3027	3.481019
1958	3.470998	1993	3.476106	3028	3.481165
1959	3.471145	1994	3.476252	3029	3.481299
1960	3.471291	1995	3.476396	3030	3.481457
1961	3.471438	1996	3.476541	3031	3.481603
1962	3.471585	1997	3.476686	3032	3.481749
1963	3.471731	1998	3.476831	3033	3.481895
1964	3.471878	1999	3.476976	3034	3.482041
1965	3.472014	2000	3.477121	3035	3.482187
1966	3.472171	2001	3.477266	3036	3.482301
1967	3.472317	2002	3.477410	3037	3.482478
1968	3.472463	2003	3.477555	3038	3.482624
1969	3.472610	2004	3.477699	3039	3.482770
1970	3.472756	2005	3.477844	3040	3.482916
2071	3.472902	3006	3.477989	3041	3.483062
1972	3.473048	3007	3.478133	3042	3.483159
1973	3.473194	3008	3.478277	3043	3.483354
1974	3.473341	3009	3.478422	3044	3.483500
1975	3.473487	3010	3.478566	3045	3.483646

Num	Logarithm	Num	Logarithm	Num	Logarithm
3046	3.483219	3081	3.488691	3116	3.493197
3047	3.483872	3082	3.488832	3117	3.493736
3048	3.484015	3083	3.488973	3118	3.493876
3049	3.484157	3084	3.489114	3119	3.494015
3050	3.484299	3085	3.489255	3120	3.494154
3051	3.484442	3086	3.489395	3121	3.494293
3052	3.484584	3087	3.489536	3122	3.494432
3053	3.484726	3088	3.489677	3123	3.494572
3054	3.484869	3089	3.489817	3124	3.494711
3055	3.485011	3090	3.489958	3125	3.494850
3056	3.485153	3091	3.490099	3126	3.494989
3057	3.485295	3092	3.490239	3127	3.495127
3058	3.485437	3093	3.490376	3128	3.495266
3059	3.485579	3094	3.490520	3129	3.495405
3060	3.485721	3095	3.490660	3130	3.495544
3061	3.485863	3096	3.490800	3131	3.495683
3062	3.486005	3097	3.490941	3132	3.495821
3063	3.486147	3098	3.491081	3133	3.495960
3064	3.486288	3099	3.491221	3134	3.496099
3065	3.486430	3100	3.491361	3135	3.496237
3066	3.486572	3111	3.491501	3136	3.496376
3067	3.486713	3112	3.491641	3137	3.496514
3068	3.486856	3113	3.491781	3138	3.496652
3069	3.486996	3114	3.491921	3139	3.496791
3070	3.487138	3115	3.492061	3140	3.496929
3071	3.487279	3106	3.492201	3141	3.497067
3072	3.487421	3107	3.492341	3142	3.497206
3073	3.487562	3108	3.492481	3143	3.497344
3074	3.487703	3109	3.492620	3144	3.497482
3075	3.487845	3110	3.492760	3145	3.497620
3076	3.487986	3111	3.492900	3146	3.497758
3077	3.488127	3112	3.493039	3147	3.497896
3078	3.488268	3113	3.493179	3148	3.498034
3079	3.488409	3114	3.493318	3149	3.498172
3080	3.488550	3115	3.493458	3150	3.498310

Num	Logarithus	Num	Logarithus	Num	Logarithus
3151	3.498448	3186	3.503245	3221	3.507259
3152	3.498586	3187	3.503382	3222	3.507396
3153	3.498724	3188	3.503518	3223	3.507532
3154	3.498861	3189	3.503654	3224	3.507669
3155	3.498999	3190	3.503790	3225	3.507805
3156	3.499137	3191	3.503926	3226	3.507941
3157	3.499274	3192	3.504062	3227	3.508078
3158	3.499412	3193	3.504198	3228	3.508214
3159	3.499549	3194	3.504334	3229	3.508350
3160	3.499687	3195	3.504470	3230	3.508486
3161	3.499824	3196	3.504606	3231	3.508622
3162	3.499961	3197	3.504742	3232	3.508758
3163	3.500099	3198	3.504878	3233	3.508894
3164	3.500236	3199	3.505014	3234	3.509030
3165	3.500373	3200	3.505150	3235	3.509166
3166	3.500510	3201	3.505285	3236	3.509302
3167	3.500648	3202	3.505421	3237	3.509438
3168	3.500785	3203	3.505556	3238	3.509574
3169	3.500922	3204	3.505692	3239	3.509710
3170	3.501059	3205	3.505828	3240	3.509845
3171	3.501196	3206	3.505963	3241	3.509981
3172	3.501333	3207	3.506099	3242	3.510117
3173	3.501470	3208	3.506234	3243	3.510252
3174	3.501606	3209	3.506369	3244	3.510388
3175	3.501743	3210	3.506505	3245	3.510524
3176	3.501880	3211	3.506640	3246	3.510659
3177	3.502017	3212	3.506775	3247	3.510795
3178	3.502153	3213	3.506910	3248	3.510930
3179	3.502290	3214	3.507045	3249	3.511066
3180	3.502427	3215	3.507181	3250	3.511201
3181	3.502563	3216	3.507316	3251	3.511337
3182	3.502700	3217	3.507451	3252	3.511472
3183	3.502836	3218	3.507586	3253	3.511608
3184	3.502973	3219	3.507721	3254	3.511743
3185	3.503109	3220	3.507855	3255	3.511878

Num	Logarithm	Num	Logarithm	Num	Logarithm
3256	3.512684	3291	3.517327	3326	3.521921
3257	3.512817	3292	3.517459	3327	3.522052
3258	3.512951	3293	3.517591	3328	3.522183
3259	3.513084	3294	3.517723	3329	3.522313
3260	3.513217	3295	3.517855	3330	3.522444
3261	3.513350	3296	3.517987	3331	3.522574
3262	3.513484	3297	3.518118	3332	3.522705
3263	3.513617	3298	3.518250	3333	3.522835
3264	3.513750	3299	3.518382	3334	3.522965
3265	3.513883	3300	3.518513	3335	3.523095
3266	3.514016	3301	3.518645	3336	3.523225
3267	3.514149	3302	3.518777	3337	3.523356
3268	3.514282	3303	3.518908	3338	3.523486
3269	3.514414	3304	3.519040	3339	3.523616
3270	3.514547	3305	3.519171	3340	3.523746
3271	3.514680	3306	3.519303	3341	3.523876
3272	3.514813	3307	3.519434	3342	3.524006
3273	3.514945	3308	3.519565	3343	3.524136
3274	3.515078	3309	3.519696	3344	3.524266
3275	3.515211	3310	3.519828	3345	3.524396
3276	3.515343	3311	3.519959	3346	3.524524
3277	3.515476	3312	3.520090	3347	3.524655
3278	3.515608	3313	3.520221	3348	3.524785
3279	3.515741	3314	3.520352	3349	3.524915
3280	3.515873	3315	3.520483	3350	3.525045
3281	3.516006	3316	3.520614	3351	3.525174
3282	3.516138	3317	3.520745	3352	3.525304
3283	3.516270	3318	3.520876	3353	3.525433
3284	3.516403	3319	3.521007	3354	3.525563
3285	3.516535	3320	3.521138	3355	3.525692
3286	3.516667	3321	3.521268	3356	3.525821
3287	3.516799	3322	3.521399	3357	3.525951
3288	3.516931	3323	3.521530	3358	3.526080
3289	3.517063	3324	3.521661	3359	3.526210
3290	3.517195	3325	3.521791	3360	3.526339

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
3391	3.528[illegible]	3396	3.530967	3401	3.531220
3392	3.528[illegible]	3397	3.531091	3402	3.531347
3393	3.528726	3398	3.531213	3403	3.531473
3394	3.528856	3399	3.531361	3404	3.531599
3395	3.528985	3400	3.531478	3405	3.531726
3396	3.529114	3401	3.531605	3406	3.531853
3397	3.529243	3402	3.531734	3407	3.531979
3398	3.529372	3403	3.531861	3408	3.532105
3399	3.529501	3404	3.531989	3409	3.532232
3400	3.529629	3405	3.532117	3410	3.532359
3401	3.529758	3406	3.532244	3411	3.532485
3402	3.529887	3407	3.532372	3412	3.532610
3403	3.530016	3408	3.532459	3413	3.532737
3404	3.530145	3409	3.532627	3414	3.532863
3405	3.530273	3410	3.532754	3415	3.532989
3406	3.530402	3411	3.532881	3416	3.533117
3407	3.530531	3412	3.533009	3417	3.533245
3408	3.530659	3413	3.533136	3418	3.533372
3409	3.530788	3414	3.533263	3419	3.533499
3410	3.530916	3415	3.533389	3420	3.533626
3411	3.531045	3416	3.533517	3421	3.533753
3412	3.531173	3417	3.533645	3422	3.533880
3413	3.531302	3418	3.533772	3423	3.534006
3414	3.531430	3419	3.533899	3424	3.534133
3415	3.531558	3420	3.534026	3425	3.534260
3416	3.531686	3421	3.534153	3426	3.534387
3417	3.531815	3422	3.534280	3427	3.534514
3418	3.531943	3423	3.534406	3428	3.534640
3419	3.532071	3424	3.534533	3429	3.534767
3420	3.532199	3425	3.534660	3430	3.534894
3421	3.532327	3426	3.534787	3431	3.535021
3422	3.532455	3427	3.534914	3432	3.535147
3423	3.532583	3428	3.535040	3433	3.535274
3424	3.532711	3429	3.535167	3434	3.535401
3425	3.532839	3430	3.535294	3435	3.535527

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
3466	3.539825	3501	3.544181	3536	3.547772
3467	3.539953	3502	3.544316	3537	3.547891
3468	3.540079	3503	3.544440	3538	3.548017
3469	3.540204	3504	3.544564	3539	3.548140
3470	3.540329	3505	3.544688	3540	3.548263
3471	3.540454	3506	3.544811	3541	3.548385
3472	3.540579	3507	3.544935	3542	3.548508
3473	3.540704	3508	3.545059	3543	3.548631
3474	3.540829	3509	3.545183	3544	3.548753
3475	3.540954	3510	3.545307	3545	3.548876
3476	3.541079	3511	3.545430	3546	3.548998
3477	3.541204	3512	3.545554	3547	3.549121
3478	3.541329	3513	3.545678	3548	3.549243
3479	3.541454	3514	3.545801	3549	3.549366
3480	3.541579	3515	3.545925	3550	3.549488
3481	3.541704	3516	3.546048	3551	3.549610
3482	3.541828	3517	3.546172	3552	3.549733
3483	3.541953	3518	3.546295	3553	3.549855
3484	3.542078	3519	3.546419	3554	3.549977
3485	3.542202	3520	3.546542	3555	3.550099
3486	3.542327	3521	3.546666	3556	3.550221
3487	3.542451	3522	3.546789	3557	3.550343
3488	3.542576	3523	3.546912	3558	3.550465
3489	3.542701	3524	3.547035	3559	3.550588
3490	3.542825	3525	3.547159	3560	3.550710
3491	3.542949	3526	3.547282	3561	3.550832
3492	3.543074	3527	3.547405	3562	3.550954
3493	3.543198	3528	3.547528	3563	3.551076
3494	3.543322	3529	3.547651	3564	3.551198
3495	3.543447	3530	3.547774	3565	3.551320
3496	3.543571	3531	3.547897	3566	3.551442
3497	3.543695	3532	3.548020	3567	3.551563
3498	3.543819	3533	3.548143	3568	3.551685
3499	3.543943	3534	3.548266	3569	3.551807
3500	3.544067	3535	3.548389	3570	3.551929

Num	Logarithm	Num	Logarithm	Num	Logarithm
3571	3.552789	3606	3.557025	3641	3.561240
3572	3.552911	3607	3.557146	3642	3.561360
3573	3.553033	3608	3.557266	3643	3.561481
3574	3.553154	3609	3.557386	3644	3.561601
3575	3.553276	3610	3.557507	2645	3.561721
3576	3.553397	3611	3.557627	3646	3.561842
3577	3.553518	3612	3.557747	3647	3.561962
3578	3.553640	3613	3.557868	3648	3.562082
3579	3.553761	3614	3.557988	3649	3.562203
3580	3.553883	3615	3.558108	3650	3.562323
3581	3.554004	3616	3.558228	3651	3.562443
3582	3.554125	3617	3.558348	3652	3.562563
3583	3.554246	3618	3.558468	3653	3.562684
3584	3.554368	3619	3.558588	3654	3.562784
3585	3.554489	3620	3.558708	3655	3.562884
3586	3.554610	3621	3.558828	3656	3.563004
3587	3.554731	3622	3.558948	3657	3.563125
3588	3.554852	3623	3.559068	3658	3.563245
3589	3.554973	3624	3.559188	3659	3.563365
3590	3.555094	3625	3.559308	3660	3.563485
3591	3.555215	3626	3.559427	3661	3.563595
3592	3.555336	3627	3.559547	3662	3.563718
3593	3.555457	3628	3.559667	3663	3.563836
3594	3.555577	3629	3.559787	3664	3.563955
3595	3.555698	3630	3.559906	3665	3.564074
3596	3.555819	3631	3.560026	3666	3.564192
3597	3.555940	3632	3.560145	3667	3.564310
3598	3.556061	3633	3.560265	3668	3.564429
3599	3.556181	3634	3.560384	3669	3.564547
3600	3.556302	3635	3.560504	3670	3.564666
3601	3.556423	3636	3.560633	3671	3.564704
3602	3.556543	3637	3.560743	3672	3.564902
3603	3.556664	3638	3.560862	3673	3.565020
3604	3.556785	3639	3.560982	3674	3.565139
3605	3.556905	3640	3.561101	3675	3.565256

Num	Logarithm	Num	Logarithm	Num	Logarithm
3676	3.565375	3712	3.569491	3748	3.573567
3677	3.565493	3713	3.569608	3749	3.573683
3678	3.565611	3714	3.569724	3750	3.573799
3679	3.565729	3715	3.569841	3751	3.573915
3680	3.565847	3716	3.569958	3752	3.574031
3681	3.565965	3717	3.570075	3753	3.574147
3682	3.566083	3718	3.570191	3754	3.574263
3683	3.566201	3719	3.570309	3755	3.574378
3684	3.566319	3720	3.570426	3756	3.574494
3685	3.566437	3721	3.570542	3757	3.574609
3686	3.566555	3722	3.570659	3758	3.574725
3687	3.566673	3723	3.570776	3759	3.574841
3688	3.566790	3724	3.570893	3760	3.574956
3689	3.566908	3725	3.571009	3761	3.575072
3690	3.567026	3726	3.571126	3762	3.575187
3691	3.567144	3727	3.571242	3763	3.575303
3692	3.567261	3728	3.571359	3764	3.575418
3693	3.567379	3729	3.571475	3765	3.575534
3694	3.567486	3730	3.571592	3766	3.575649
3695	3.567614	3731	3.571708	3767	3.575765
3696	3.567732	3732	3.571825	3768	3.575880
3697	3.567849	3733	3.571941	3769	3.575995
3698	3.567966	3734	3.572058	3770	3.576111
3699	3.568084	3735	3.572174	3771	3.576226
3700	3.568201	3736	3.572296	3772	3.576341
3701	3.568319	3737	3.572406	3773	3.576456
3702	3.568436	3738	3.572523	3774	3.576571
3703	3.568553	3739	3.572639	3775	3.576686
3704	3.568671	3740	3.572755	3776	3.576801
3705	3.568788	3741	3.572871	3777	3.576916
3706	3.568905	3742	3.572987	3778	3.577032
3707	3.569022	3743	3.573103	3779	3.577147
3708	3.569139	3744	3.573219	3780	3.577262
3709	3.569256	3745	3.573335	3781	3.577376
3710	3.569373	3746	3.573451	3782	3.577491

Num	Logarithm	Num	Logarithm	Num	Logarithm
3781	3.577668	3816	3.581668	3851	3.585573
3782	3.577721	3817	3.581721	3852	3.585686
3783	3.577836	3818	3.581834	3853	3.585799
3784	3.577951	3819	3.581949	3854	3.585911
3785	3.578061	3820	3.582063	3855	3.586024
3786	3.578110	3821	3.582177	3856	3.586137
3787	3.578185	3822	3.582290	3857	3.586249
3788	3.578410	3823	3.582404	3858	3.586362
3789	3.578524	3824	3.582517	3859	3.586474
3790	3.578639	3825	3.582631	3860	3.586587
3791	3.578753	3826	3.582745	3861	3.586699
3792	3.578868	3827	3.582858	3862	3.586812
3793	3.578982	3828	3.582971	3863	3.586924
3794	3.579097	3829	3.583085	3864	3.587037
3795	3.579211	3830	3.583198	3865	3.587149
3796	3.579326	3831	3.583312	3866	3.587261
3797	3.579440	3832	3.583425	3867	3.587374
3798	3.579555	3833	3.583538	3868	3.587486
3799	3.579669	3834	3.583652	3869	3.587598
3800	3.579783	3835	3.583765	3870	3.587711
3801	3.579897	3836	3.583878	3871	3.587823
3802	3.580012	3837	3.583991	3872	3.587935
3803	3.580126	3838	3.584104	3873	3.588047
3804	3.580240	3839	3.584218	3874	3.588159
3805	3.580354	3840	3.584331	3875	3.588271
3806	3.580468	3841	3.584444	3876	3.588383
3807	3.580582	3842	3.584557	3877	3.588495
3808	3.580696	3843	3.584670	3878	3.588607
3809	3.580811	3844	3.584783	3879	3.588719
3810	3.580925	3845	3.584896	3880	3.588831
3811	3.581038	3846	3.585009	3881	3.588943
3812	3.581152	3847	3.585122	3882	3.589055
3813	3.581266	3848	3.585234	3883	3.589167
3814	3.581380	3849	3.585347	3884	3.589279
3815	3.581494	3850	3.585460	3885	3.589391

Num	Logarithm	Num	Logarithm	Num	Logarithm
3886	3.589502	3921	3.593396	3956	3.597272
3887	3.589614	3922	3.593509	3957	3.597384
3888	3.589726	3923	3.593618	3958	3.597494
3889	3.589837	3924	3.593729	3959	3.597605
3890	3.589949	3925	3.593839	3960	3.597714
3891	3.590061	3926	3.593950	3961	3.597824
3892	3.590172	3927	3.594060	3962	3.597934
3893	3.590284	3928	3.594171	3963	3.598044
3894	3.590395	3929	3.594282	3964	3.598153
3895	3.590507	3930	3.594391	3965	3.598262
3896	3.590618	3931	3.594503	3966	3.598372
3897	3.590730	3932	3.594613	3967	3.598482
3898	3.590841	3933	3.594723	3968	3.598591
3899	3.590953	3934	3.594834	3969	3.598701
3900	3.591064	3935	3.594944	3970	3.598810
3901	3.591175	3936	3.595055	3971	3.598919
3902	3.591287	3937	3.595165	3972	3.599028
3903	3.591398	3938	3.595275	3973	3.599138
3904	3.591509	3939	3.595386	3974	3.599247
3905	3.591621	3940	3.595498	3975	3.599357
3906	3.591732	3941	3.595606	3976	3.599466
3907	3.591843	3942	3.595716	3977	3.599575
3908	3.591954	3943	3.595826	3978	3.599684
3909	3.592065	3944	3.595936	3979	3.599793
3910	3.592176	3945	3.596047	3980	3.599902
3911	3.592287	3946	3.596157	3981	3.600011
3912	3.592398	3947	3.596267	3982	3.600120
3913	3.592509	3948	3.596377	3983	3.600229
3914	3.592620	3949	3.596487	3984	3.600339
3915	3.592731	3950	3.596597	3985	3.600448
3916	3.592842	3951	3.596707	3986	3.600557
3917	3.592953	3952	3.596816	3987	3.600666
3918	3.593064	3953	3.596926	3988	3.600775
3919	3.593175	3954	3.597036	3989	3.600884
3920	3.593286	3955	3.597146	3990	3.600993

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
3991	3.600[illegible]81	4026	3.604873	4061	3.608633
3992	3.600[illegible]80	4027	3.604981	4062	3.608739
3993	3.600[illegible]79	4028	3.605089	4063	3.608846
3994	3.600[illegible]78	4029	3.605197	4064	3.608952
3995	3.601716	4030	3.605305	4065	3.609060
3996	3.601625	4031	3.605412	4066	3.609167
3997	3.601734	4032	3.605520	4067	3.609274
3998	3.601842	4033	3.605628	4068	3.609380
3999	3.601951	4034	3.605735	4069	3.609487
4000	3.602060	4035	3.605843	4070	3.609594
4001	3.602168	4036	3.605951	4071	3.609701
4002	3.602277	4037	3.606058	4072	3.609807
4003	3.602385	4038	3.606166	4073	3.609914
4004	3.602494	4039	3.606273	4074	3.610021
4005	3.602602	4040	3.606381	4075	3.610127
4006	3.602710	4041	3.606488	4076	3.610234
4007	3.602819	4042	3.606596	4077	3.610340
4008	3.602927	4043	3.606703	4078	3.610447
4009	3.603036	4044	3.606811	4079	3.610553
4010	3.603144	4045	3.606918	4080	3.610660
4011	3.603252	4046	3.607025	4081	3.610766
4012	3.603360	4047	3.607133	4082	3.610873
4013	3.603469	4048	3.607240	4083	3.610979
4014	3.603577	4049	3.607347	4084	3.611085
4015	3.603685	4050	3.607455	4085	3.611192
4016	3.603793	4051	3.607562	4086	3.611298
4017	3.603901	4052	3.607669	4087	3.611404
4018	3.604009	4053	3.607776	4088	3.611510
4019	3.604118	4054	3.607883	4089	3.611617
4020	3.604226	4055	3.607990	4090	3.611723
4021	3.604334	4056	3.608097	4091	3.611829
4022	3.604442	4057	3.608205	4092	3.611935
4023	3.604550	4058	3.608312	4093	3.612041
4024	3.604658	4059	3.608419	4094	3.612147
4025	3.604765	4060	3.608526	4095	3.612253

Num	Logarithm	Num	Logarithm	Num	Logarithm
4096	3.612359	4131	3.616055	4166	3.619719
4097	3.612466	4132	3.616160	4167	3.619823
4098	3.612572	4133	3.616265	4168	3.619927
4099	3.612677	4134	3.616370	4169	3.620031
4100	3.612783	4135	3.616475	4170	3.620136
4101	3.612889	4136	3.616580	4171	3.620240
4102	3.612995	4137	3.616685	4172	3.620344
4103	3.613101	4138	3.616790	4173	3.620448
4104	3.613207	4139	3.616895	4174	3.620552
4105	3.613313	4140	3.617000	4175	3.620656
4106	3.613418	4141	3.617105	4176	3.620760
4107	3.613524	4142	3.617210	4177	3.620864
4108	3.613630	4143	3.617314	4178	3.620968
4109	3.613736	4144	3.617419	4179	3.621072
4110	3.613841	4145	3.617524	4180	3.621176
4111	3.613947	4146	3.617629	4181	3.621280
4112	3.614053	4147	3.617734	4182	3.621384
4113	3.614158	4148	3.617838	4183	3.621487
4114	3.614264	4149	3.617943	4184	3.621591
4115	3.614369	4150	3.618048	4185	3.621695
4116	3.614475	4151	3.618152	4186	3.621799
4117	3.614580	4152	3.618257	4187	3.621903
4118	3.614686	4153	3.618361	4188	3.622006
4119	3.614791	4154	3.618466	4189	3.622110
4120	3.614897	4155	3.618571	4190	3.622214
4121	3.615002	4156	3.618675	4191	3.622317
4122	3.615108	4157	3.618780	4192	3.622421
4123	3.615213	4158	3.618884	4193	3.622524
4124	3.615318	4159	3.618988	4194	3.622628
4125	3.615424	4160	3.619093	4195	3.622732
4126	3.615529	4161	3.619197	4196	3.622835
4127	3.615634	4162	3.619301	4197	3.622939
4128	3.615739	4163	3.619406	4198	3.623042
4129	3.615844	4164	3.619510	4199	3.623146
4130	3.615950	4165	3.619614	4200	3.623249

Num	Logarithm	Num	Logarithm	Num	Logarithm
4101	3.613332	4136	3.616955	4171	3.630519
4102	3.613385	4137	3.617008	4172	3.630631
4103	3.613439	4138	3.617161	4173	3.630732
4104	3.613661	4139	3.617263	4174	3.630834
4105	3.613768	4140	3.617365	4175	3.630937
4106	3.613869	4141	3.617468	4176	3.631037
4107	3.613972	4142	3.617570	4177	3.631139
4108	3.614075	4143	3.617673	4178	3.631240
4109	3.614178	4144	3.617775	4179	3.631342
4110	3.614282	4145	3.617877	4180	3.631443
4111	3.614385	4146	3.617980	4181	3.631545
4112	3.614488	4147	3.618082	4182	3.631646
4113	3.614591	4148	3.618184	4183	3.631748
4114	3.614694	4149	3.618286	4184	3.631849
4115	3.614797	4150	3.618388	4185	3.631950
4116	3.614900	4151	3.618491	4186	3.632052
4117	3.615003	4152	3.618593	4187	3.632153
4118	3.615106	4153	3.618695	4188	3.632254
4119	3.615209	4154	3.618797	4189	3.632356
4120	3.615312	4155	3.618899	4190	3.632457
4121	3.615415	4156	3.619001	4191	3.632558
4122	3.615518	4157	3.619103	4192	3.632659
4123	3.615621	4158	3.619205	4193	3.632760
4124	3.615723	4159	3.619307	4194	3.632861
4125	3.615826	4160	3.619409	4195	3.632963
4126	3.615929	4161	3.619511	4196	3.633064
4127	3.616032	4162	3.619613	4197	3.633165
4128	3.616134	4163	3.619715	4198	3.633266
4129	3.616237	4164	3.619817	4199	3.633367
4130	3.616340	4165	3.619919	4200	3.633468
4131	3.616443	4166	3.620020	4201	3.633569
4132	3.616545	4167	3.620122	4202	3.633670
4133	3.616648	4168	3.620224	4203	3.633771
4134	3.616750	4169	3.620326	4204	3.633872
4135	3.616853	4170	3.620427	4205	3.633973

Num	Logarithm.	Num	Logarithm.	Num	Logarithm.
4306	3.634074	4341	3.637389	4376	3.641077
4307	3.634174	4342	3.637489	4377	3.641176
4308	3.634275	4343	3.637589	4378	3.641275
4309	3.634376	4344	3.637689	4379	3.641374
4310	3.634477	4345	3.637789	4380	3.641474
4311	3.634578	4346	3.637889	4381	3.641573
4312	3.634678	4347	3.637989	4382	3.641672
4313	3.634779	4348	3.638089	4383	3.641771
4314	3.634880	4349	3.638189	4384	3.641870
4315	3.634980	4350	3.638289	4385	3.641969
4316	3.635081	4351	3.638389	4386	3.642068
4317	3.635182	4352	3.638488	4387	3.642167
4318	3.635282	4353	3.638588	4388	3.642266
4319	3.635383	4354	3.638688	4389	3.642365
4320	3.635483	4355	3.638788	4390	3.642464
4321	3.635584	4356	3.638887	4391	3.642563
4322	3.635684	4357	3.638987	4392	3.642662
4323	3.635785	4358	3.639087	4393	3.642761
4324	3.635885	4359	3.639186	4394	3.642860
4325	3.635985	4360	3.639286	4395	3.642959
4326	3.636086	4361	3.639386	4396	3.643057
4327	3.636186	4362	3.639485	4397	3.643156
4328	3.636287	4363	3.639585	4398	3.643255
4329	3.636387	4364	3.639684	4399	3.643354
4330	3.636487	4365	3.639784	4400	3.643452
4331	3.636588	4366	3.640083	4401	3.643551
4332	3.636688	4367	3.640183	4402	3.643650
4333	3.636788	4368	3.640282	4403	3.643748
4334	3.636888	4369	3.640382	4404	3.643847
4335	3.636989	4370	3.640481	4405	3.643945
4336	3.637089	4371	3.640580	4406	3.644044
4337	3.637189	4372	3.640680	4407	3.644143
4338	3.637289	4373	3.640779	4408	3.644241
4339	3.637389	4374	3.640878	4409	3.644340
4340	3.637489	4375	3.640978	4410	3.644438

Num	Logarithm	Num	Logarithm	Num	Logarithm
4411	3.644737	4446	3.647969	4481	3.651371
4412	3.644635	4447	3.648067	4482	3.651471
4413	3.644733	4448	3.648154	4483	3.651563
4414	3.644832	4449	3.648262	4484	3.651645
4415	3.644930	4450	3.648360	4485	3.651761
4416	3.645029	4451	3.648457	4486	3.651859
4417	3.645127	4452	3.648555	4487	3.651956
4418	3.645225	4453	3.648652	4488	3.652052
4419	3.645324	4454	3.648750	4489	3.652149
4420	3.645422	4455	3.648847	4490	3.652246
4421	3.645520	4456	3.648945	4491	3.652343
4422	3.645618	4457	3.649042	4492	3.652439
4423	3.645716	4458	3.649140	4493	3.652536
4424	3.545815	4459	3.649237	4494	3.652633
4425	3.645913	4460	3.649334	4495	3.652729
4426	3.646011	4461	3.649432	4496	3.652826
4427	3.646109	4462	3.649529	4497	3.652922
4428	3.546207	4463	3.649626	4498	3.653019
4429	3.546305	4464	3.649724	4499	3.653116
4430	3.646403	4465	3.649821	4500	3.653212
4431	3.646501	4466	3.649918	4501	3.653309
4432	3.646599	4467	3.650016	4502	3.653405
4433	3.646697	4468	3.650113	4503	3.653502
4434	3.645795	4469	3.650210	4504	3.653598
4435	3.646893	4470	3.650307	4505	3.653694
4436	3.647991	4471	3.650404	4506	3.653791
4437	3.647089	4472	3.650501	4507	3.653887
4438	3.647187	4473	3.650598	4508	3.653983
4439	3.647285	4474	3.650696	4509	3.654080
4440	3.547281	4475	3.650793	4510	3.654176
4441	3.647480	4476	3.650890	4511	3.654272
4442	3.647578	4477	3.650987	4512	3.654369
4443	3.647676	4478	3.651084	4513	3.654465
4444	3.647774	4479	3.651181	4514	3.654561
4445	3.647871	4480	3.651278	4515	3.654657

Num	Logaritho	Num	Logaritho	Num	Logaritho
4516	3.654753	4551	3.658106	4586	3.661434
4517	3.654850	4552	3.658201	4587	3.661528
4518	3.654946	4553	3.658297	4588	3.661623
4519	3.655042	4554	3.658393	4589	3.661718
4520	3.655138	4555	3.658488	4590	3.661812
4521	3.655230	4550	3.658583	4591	3.661907
4522	3.655334	4557	3.658679	4592	3.662001
4523	3.655426	4558	3.658774	4593	3.662096
4524	3.655522	4559	3.658869	4594	3.662191
4525	3.655618	4560	3.658964	4595	3.662285
4526	3.655714	4561	3.659060	4596	3.662380
4527	3.655810	4562	3.659155	4597	3.662474
4528	3.655905	4563	3.659250	4598	3.662569
4529	3.656002	4564	3.659345	4599	3.662663
4530	3.656098	4565	3.659440	4600	3.662757
4531	3.656194	4566	3.659535	4601	3.662852
4532	3.656289	4567	3.659631	4602	3.662946
4533	3.656385	4568	3.659726	4603	3.663041
4534	3.656481	4569	3.659821	4604	3.663135
4535	3.656577	4570	3.659916	4605	3.663229
4536	3.656673	4571	3.660011	4606	3.663323
4537	3.656768	4572	3.660106	4607	3.663418
4538	3.656864	4573	3.660201	4608	3.663512
4539	3.656969	4574	3.660296	4609	3.663606
4540	3.657055	4575	3.660391	4610	3.663700
4541	3.657151	4576	3.660486	4611	3.663795
4542	3.657247	4577	3.660580	4612	3.663889
4543	3.657342	4578	3.660675	4613	3.663983
4544	3.657438	4579	3.660770	4614	3.664077
4545	3.657533	4580	3.660865	4615	3.664171
4546	3.657629	4581	3.660960	4616	3.664265
4547	3.657725	4582	3.661055	4617	3.664359
4548	3.657820	4583	3.661149	4618	3.664453
4549	3.657915	4584	3.661244	4619	3.664548
4550	3.658011	4585	3.661339	4620	3.664642

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
4621	3.664956	4656	3.668013	4691	3.671261
4622	3.664988	4657	3.668106	4692	3.671333
4623	3.665020	4658	3.668199	4693	3.671441
4624	3.665052	4659	3.668292	4694	3.671554
4625	3.665084	4660	3.668385	4695	3.671663
4626	3.665205	4661	3.668479	4696	3.671721
4627	3.665299	4662	3.668572	4697	3.671823
4628	3.665393	4663	3.668665	4698	3.671913
4629	3.665487	4664	3.668758	4699	3.672005
4630	3.665581	4665	3.668851	4700	3.672097
4631	3.665674	4666	3.668944	4701	3.672190
4632	3.665768	4667	3.669037	4702	3.672282
4633	3.665862	4668	3.669130	4703	3.672375
4634	3.665956	4669	3.669223	4704	3.672467
4635	3.666049	4670	3.669316	4705	3.672559
4636	3.666143	4671	3.669409	4706	3.672651
4637	3.666237	4672	3.669502	4707	3.672744
4638	3.666330	4673	3.669595	4708	3.672836
4639	3.666424	4674	3.669688	4709	3.672928
4640	3.666518	4675	3.669781	4710	3.673020
4641	3.666611	4676	3.669874	4711	3.673113
4642	3.666705	4677	3.669967	4712	3.673205
4643	3.666798	4678	3.670060	4713	3.673297
4644	3.666892	4679	3.670153	4714	3.673389
4645	3.666985	4680	3.670245	4715	3.673481
4646	3.667079	4681	3.670338	4716	3.673573
4547	3.667172	4682	3.670431	4717	3.673665
4648	3.667266	4683	3.670524	4718	3.673757
4649	3.667359	4684	3.670616	4719	3.673850
4650	3.667453	4685	3.670709	4710	3.673942
4651	3.667546	4686	3.670802	4721	3.674034
4652	3.667639	4687	3.670895	4722	3.674126
4653	3.667733	4688	3.670987	4723	3.674217
4654	3.667826	4689	3.671080	4724	3.674309
4655	3.667919	4690	3.671172	4725	3.674401

Num	Logarithm	Num	Logarithm	Num	Logarithm
4726	3.674693	4761	3.677758	4796	3.680879
4727	3.674785	4762	3.677789	4797	3.680969
4728	3.674877	4763	3.677880	4798	3.681060
4729	3.674969	4764	3.677911	4799	3.681150
4730	3.675061	4765	3.678002	4800	3.681241
4731	3.675153	4766	3.678124	4801	3.681331
4732	3.675244	4767	3.678245	4802	3.681422
4733	3.675336	4768	3.678336	4803	3.681512
4734	3.675428	4769	3.678427	4804	3.681603
4735	3.675520	4770	3.678518	4805	3.681693
4736	3.675611	4771	3.678609	4806	3.681783
4737	3.675703	4772	3.678700	4807	3.681874
4738	3.675795	4773	3.678791	4808	3.681964
4739	3.675886	4774	3.678883	4809	3.682054
4740	3.675978	4775	3.678973	4810	3.682145
4741	3.676070	4776	3.679064	4811	3.682235
4742	3.676161	4777	3.679155	4812	3.682325
4743	3.676253	4778	3.679246	4813	3.682405
4744	3.676344	4779	3.679337	4814	3.682516
4745	3.676436	4780	3.679427	4815	3.682596
4746	3.676527	4781	3.679518	4816	3.682686
4747	3.676619	4782	3.679609	4817	3.682776
4748	3.676710	4783	3.679700	4818	3.682866
4749	3.676802	4784	3.679790	4819	3.682956
4750	3.676893	4785	3.679881	4820	3.683047
4751	3.676985	4786	3.679972	4821	3.683137
4752	3.677076	4787	3.680063	4822	3.683227
4753	3.677167	4788	3.680154	4823	3.683317
4754	3.677259	4789	3.680244	4824	3.683407
4755	3.677350	4790	3.680335	4825	3.683497
4756	3.677441	4791	3.680426	4826	3.683587
4757	3.677533	4792	3.680516	4827	3.683677
4758	3.677624	4793	3.680607	4828	3.683767
4759	3.677715	4794	3.680698	4829	3.683857
4760	3.677806	4795	3.680788	4830	3.683947

Num	Logaritbus	Num	Logaritbus	Num	Logaritbus
4831	3.684057	4866	3.687172	4901	3.690284
4832	3.684126	4867	3.687261	4902	3.690373
4833	3.684216	4868	3.687350	4903	3.690461
4834	3.684306	4869	3.687439	4904	3.690550
4835	3.684396	4870	3.687529	4905	3.690638
4836	3.684486	4871	3.687618	4906	3.690727
4837	3.684576	4872	3.687707	4907	3.690816
4838	3.684665	4873	3.687796	4908	3.690904
4839	3.684755	4874	3.687885	4909	3.690993
4840	3.684845	4875	3.687974	4910	3.691081
4841	3.684935	4876	3.688063	4911	3.691169
4842	3.685024	4877	3.688152	4912	3.691258
4843	3.685114	4878	3.688242	4913	3.691346
4844	3.685204	4879	3.688330	4914	3.691435
4845	3.685293	4880	3.688419	4915	3.691523
4846	3.685383	4881	3.688508	4916	3.691611
4847	3.685473	4882	3.688597	4917	3.691700
4848	3.685562	4883	3.688686	4918	3.691788
4849	3.685652	4884	3.688775	4919	3.691876
4850	3.685741	4885	3.688864	4920	3.691964
4851	3.685831	4886	3.688953	4921	3.692053
4852	3.685920	4887	3.689042	4922	3.692141
4853	3.686010	4888	3.689131	4923	3.692229
4854	3.686089	4889	3.689220	4924	3.692318
4855	3.686199	4890	3.689308	4925	3.692406
4856	3.686278	4891	3.689397	4926	3.692494
4857	3.686368	4892	3.689486	4927	3.692582
4858	3.686457	4893	3.689575	4928	3.692670
4859	3.686546	4894	3.689664	4929	3.692758
4860	3.686636	4895	3.689752	4930	3.692846
4861	3.686725	4896	3.689841	4931	3.692935
4862	3.686814	4897	3.689930	4932	3.693023
4863	3.686904	4898	3.690018	4933	3.693111
4864	3.686993	4899	3.690107	4934	3.693199
4865	3.687082	4900	3.690196	4935	3.693287

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
4936	3.693375	4972	3.696443	5008	3.699490
4937	3.693483	4973	3.696551	5009	3.699597
4938	3.693591	4974	3.696658	5010	3.699704
4939	3.693699	4975	3.696766	5011	3.699811
4940	3.693806	4976	3.696873	5012	3.699918
4941	3.693914	4977	3.696981	5013	3.700025
4942	3.694022	4978	3.697088	5014	3.700132
4943	3.694130	4979	3.697196	5015	3.700239
4944	3.694238	4980	3.697303	5016	3.700346
4945	3.694346	4981	3.697411	5017	3.700453
4946	3.694453	4982	3.697518	5018	3.700560
4947	3.694561	4983	3.697626	5019	3.700667
4948	3.694669	4984	3.697733	5020	3.700774
4949	3.694777	4985	3.697841	5021	3.700881
4950	3.694885	4986	3.697948	5022	3.700988
4951	3.694992	4987	3.698056	5023	3.701095
4952	3.695100	4988	3.698163	5024	3.701202
4953	3.695208	4989	3.698271	5025	3.701309
4954	3.695316	4990	3.698378	5026	3.701416
4955	3.695424	4991	3.698486	5027	3.701523
4956	3.695531	4992	3.698593	5028	3.701630
4957	3.695639	4993	3.698701	5029	3.701737
4958	3.695747	4994	3.698808	5030	3.701844
4959	3.695855	4995	3.698916	5031	3.701951
4960	3.695962	4996	3.699023	5032	3.702058
4961	3.696070	4997	3.699131	5033	3.702165
4962	3.696178	4998	3.699238	5034	3.702272
4963	3.696286	4999	3.699346	5035	3.702379
4964	3.696393	5000	3.699453	5036	3.702486
4965	3.696501	5001	3.699560	5037	3.702593
4966	3.696609	5002	3.699668	5038	3.702700
4967	3.696716	5003	3.699775	5039	3.702807
4968	3.696824	5004	3.699883	5040	3.702914
4969	3.696932	5005	3.699990	5041	3.703021
4970	3.697039	5006	3.700097	5042	3.703128

Num	Logarithm	Num	Logarithm	Num	Logarithm
5041	3.702[illegible]	5076	3.703[illegible]	5111	3.708[illegible]
5042	3.702[illegible]	5077	3.703607	5112	3.708390
5043	3.702[illegible]	5078	3.703692	5113	3.708575
5044	3.702[illegible]	5079	3.703778	5114	3.708760
5045	3.702[illegible]	5080	3.703864	5115	3.708845
5046	3.703036	5081	3.703949	5116	3.709030
5047	3.703122	5082	3.704034	5117	3.709214
5048	3.703208	5083	3.704120	5118	3.709400
5049	3.703294	5084	3.704205	5119	3.709585
5050	3.703380	5085	3.704291	5120	3.709770
5051	3.703466	5086	3.704376	5121	3.709954
5052	3.703552	5087	3.704461	5122	3.710139
5053	3.703638	5088	3.704547	5123	3.710324
5054	3.703724	5089	3.704632	5124	3.710509
5055	3.703810	5090	3.704717	5125	3.710693
5056	3.703896	5091	3.704803	5126	3.710878
5057	3.703982	5092	3.704888	5127	3.711063
5058	3.704068	5093	3.704973	5128	3.711248
5059	3.704154	5094	3.705058	5129	3.711432
5060	3.704240	5095	3.705144	5130	3.711617
5061	3.704326	5096	3.705229	5131	3.711802
5062	3.704412	5097	3.705314	5132	3.711986
5063	3.704497	5098	3.705399	5133	3.712171
5064	3.704583	5099	3.705485	5134	3.712356
5065	3.704669	5100	3.705570	5135	3.712540
5066	3.704755	5101	3.705655	5136	3.712725
5067	3.704840	5102	3.705740	5137	3.712909
5068	3.704926	5103	3.705825	5138	3.713094
5069	3.705012	5104	3.705910	5139	3.713278
5070	3.705098	5105	3.705995	5140	3.713463
5071	3.705183	5106	3.706080	5141	3.713647
5072	3.705269	5107	3.706165	5142	3.713832
5073	3.705354	5108	3.706250	5143	3.714016
5074	3.705440	5109	3.706335	5144	3.714201
5075	3.705526	5110	3.706420	5145	3.714385

Num.	Logarithmi	Num.	Logarithmi	Num.	Logarithmi
5145	3.711469	5181	3.711413	5217	3.711357
5146	3.711534	5182	3.711497	5218	3.711420
5147	3.711598	5183	3.711481	5219	3.711484
5148	3.711662	5184	3.711545	5220	3.711547
5149	3.711726	5185	3.711609	5221	3.711611
5150	3.711807	5186	3.711748	5222	3.711670
5151	3.711854	5187	3.711832	5223	3.711753
5152	3.711918	5188	3.711916	5224	3.711836
5153	3.711982	5189	3.711980	5225	3.711920
5154	3.712046	5190	3.712044	5226	3.712003
5155	3.712110	5191	3.712108	5227	3.712086
5156	3.712174	5192	3.712171	5228	3.712169
5157	3.712238	5193	3.712235	5229	3.712252
5158	3.712302	5194	3.712299	5230	3.712335
5159	3.712366	5195	3.712363	5231	3.712418
5160	3.712430	5196	3.712427	5232	3.712501
5161	3.712494	5197	3.712491	5233	3.712584
5162	3.712558	5198	3.712555	5234	3.712667
5163	3.712622	5199	3.712619	5235	3.712750
5164	3.712686	5200	3.712683	5236	3.712833
5165	3.712750	5201	3.712747	5237	3.712916
5166	3.712814	5202	3.712811	5238	3.712999
5167	3.712878	5203	3.712875	5239	3.713082
5168	3.712942	5204	3.712939	5240	3.713165
5169	3.713006	5205	3.713003	5241	3.713248
5170	3.713070	5206	3.713067	5242	3.713331
5171	3.713134	5207	3.713131	5243	3.713414
5172	3.713198	5208	3.713195	5244	3.713497
5173	3.713262	5209	3.713259	5245	3.713580
5174	3.713326	5210	3.713323	5246	3.713663
5175	3.713390	5211	3.713387	5247	3.713746
5176	3.713454	5212	3.713451	5248	3.713829
5177	3.713518	5213	3.713515	5249	3.713912
5178	3.713582	5214	3.713579	5250	3.713995
5179	3.713646	5215	3.713643	5251	3.714078
5180	3.713710	5216	3.713707	5252	3.714161

Num	Logaritho	Num	Logaritho	Num	Logaritho
5251	3.720092	5286	3.723127	5321	3.725953
5252	3.720324	5287	3.723289	5322	3.726074
5253	3.720407	5288	3.723391	5323	3.726175
5254	3.720490	5289	3.723573	5324	3.726278
5255	3.720572	5290	3.723655	5325	3.726319
5256	3.720655	5291	3.723737	5326	3.726401
5257	3.720738	5292	3.723619	5327	3.726482
5258	3.720820	5293	3.723701	5328	3.726564
5259	3.720903	5294	3.723783	5329	3.726645
5260	3.720985	5295	3.723866	5330	3.726727
5261	3.721068	5296	3.723948	5331	3.726808
5262	3.721150	5297	3.724030	5332	3.726890
5263	3.721233	5298	3.724112	5333	3.726971
5264	3.721315	5299	3.724193	5334	3.727053
5265	3.721398	5300	3.724275	5335	3.727134
5266	3.721480	5301	3.724357	5336	3.727215
5267	3.721563	5302	3.724439	5337	3.727297
5268	3.721645	5303	3.724521	5338	3.727378
5269	3.721728	5304	3.724603	5339	3.727459
5270	3.721810	5305	3.724685	5340	3.727541
5271	3.721893	5306	3.724767	5341	3.727622
5272	3.721975	5307	3.724849	5342	3.727703
5273	3.722057	5308	3.724930	5343	3.727785
5274	3.722140	5309	3.725012	5344	3.727866
5275	3.722222	5310	3.725094	5345	3.727947
5276	3.722304	5311	3.725176	5346	3.728029
5277	3.722387	5312	3.725258	5347	3.728110
5278	3.722469	5213	3.725339	5348	3.728191
5279	3.722551	5314	3.725421	5349	3.728272
5280	3.722633	5315	3.725503	5350	3.728353
5281	3.722716	5316	3.725585	5351	3.728434
5282	3.722798	5317	3.725666	5352	3.728516
5283	3.722880	5318	3.725748	5353	3.728597
5284	3.722962	5319	3.725830	5354	3.728678
5285	3.723045	5320	3.725912	5355	3.728759

Num	Logaritho	Num	Logaritho	Num	Logaritho
5356	3.728840	5391	3.731669	5426	3.734479
5357	3.728921	5392	3.731749	5427	3.734559
5358	3.729002	5393	3.731830	5428	3.734639
5359	3.729083	5394	3.731910	5429	3.734719
5360	3.729164	5395	3.731991	5430	3.734799
5361	3.729245	5396	3.732071	5431	3.734879
5362	3.729326	5397	3.732152	5432	3.734959
5363	3.729407	5398	3.732232	5433	3.735039
5364	3.729488	5399	3.732313	5434	3.735119
5365	3.729569	5400	3.732393	5435	3.735199
5366	3.729650	5401	3.732474	5436	3.735279
5367	3.729731	5402	3.732554	5437	3.735359
5368	3.729812	5403	3.732635	5438	3.735439
5369	3.729893	5404	3.732715	5439	3.735519
5370	3.729974	5405	3.732795	5440	3.735598
5371	3.730055	5406	3.732876	5441	3.735678
5372	3.730136	5407	3.732956	5442	3.735758
5373	3.730216	5408	3.733036	5443	3.735838
5374	3.730297	5409	3.733117	5444	3.735918
5375	3.730378	5410	3.733197	5445	3.735997
5376	3.730459	5411	3.733277	5446	3.736077
5377	3.730540	5412	3.733357	5447	3.736157
5378	3.730620	5413	3.733438	5448	3.736237
5379	3.730701	5414	3.733518	5449	3.736316
5380	3.730782	5415	3.733598	5450	3.736396
5381	3.730863	5416	3.733678	5451	3.736476
5382	3.730943	5417	3.733758	5452	3.736555
5383	3.731024	5418	3.733839	5453	3.736635
5384	3.731104	5419	3.733919	5454	3.736715
5385	3.731185	5420	3.733999	5455	3.736794
5386	3.731266	5421	3.734079	5456	3.736874
5387	3.731347	5422	3.734159	5457	3.736954
5388	3.731427	5423	3.734239	5458	3.737033
5389	3.731508	5424	3.734319	5459	3.737113
5390	3.731588	5425	3.734399	5460	3.737192

Num.	Log.	Num.	Log.	Num.	Log.
5461	3.737[illegible]	5496	3.740[illegible]	5531	3.743[illegible]
5462	3.737[illegible]	5497	3.740[illegible]	5532	3.743[illegible]
5463	3.737[illegible]	5498	3.740[illegible]	5533	3.743[illegible]
5464	3.737[illegible]	5499	3.740[illegible]	5534	3.743[illegible]
5465	3.737[illegible]	5500	3.740[illegible]	5535	3.743[illegible]
5466	3.737[illegible]	5501	3.740[illegible]	5536	3.743[illegible]
5467	3.737[illegible]	5502	3.740[illegible]	5537	3.743[illegible]
5468	3.737[illegible]	5503	3.740[illegible]	5538	3.743[illegible]
5469	3.737[illegible]	5504	3.740[illegible]	5539	3.743[illegible]
5470	3.737[illegible]	5505	3.740[illegible]	5540	3.743[illegible]
5471	3.737[illegible]	5506	3.740[illegible]	5541	3.743[illegible]
5472	3.737[illegible]	5507	3.740[illegible]	5542	3.743[illegible]
5473	3.737[illegible]	5508	3.740[illegible]	5543	3.743[illegible]
5474	3.737[illegible]	5509	3.740[illegible]	5544	3.743[illegible]
5475	3.737[illegible]	5510	3.740[illegible]	5545	3.743[illegible]
5476	3.737[illegible]	5511	3.740[illegible]	5546	3.743[illegible]
5477	3.737[illegible]	5512	3.740[illegible]	5547	3.744[illegible]
5478	3.737[illegible]	5513	3.740[illegible]	5548	3.744[illegible]
5479	3.737[illegible]	5514	3.740[illegible]	5549	3.744[illegible]
5480	3.737[illegible]	5515	3.740[illegible]	5550	3.744[illegible]
5481	3.738[illegible]	5516	3.740[illegible]	5551	3.744[illegible]
5482	3.738[illegible]	5517	3.740[illegible]	5552	3.744[illegible]
5483	3.738[illegible]	5518	3.740[illegible]	5553	3.744[illegible]
5484	3.738[illegible]	5519	3.740[illegible]	5554	3.744[illegible]
5485	3.738[illegible]	5520	3.740[illegible]	5555	3.744[illegible]
5486	3.738[illegible]	5521	3.740[illegible]	5556	3.744[illegible]
5487	3.738[illegible]	5522	3.740[illegible]	5557	3.744[illegible]
5488	3.738[illegible]	5523	3.740[illegible]	5558	3.744[illegible]
5489	3.738[illegible]	5524	3.740[illegible]	5559	3.744[illegible]
5490	3.738[illegible]	5525	3.740[illegible]	5560	3.744[illegible]
5491	3.738[illegible]	5526	3.740[illegible]	5561	3.744[illegible]
5492	3.738[illegible]	5527	3.740[illegible]	5562	3.744[illegible]
5493	3.738[illegible]	5528	3.740[illegible]	5563	3.744[illegible]
5494	3.738[illegible]	5529	3.740[illegible]	5564	3.744[illegible]
5495	3.738[illegible]	5530	3.740[illegible]	5565	3.744[illegible]

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
1566	3.745593	1601	3.748161	1636	3.750979
1567	3.745671	1602	3.748241	1637	3.751048
1568	3.745699	1603	3.748320	1638	3.751185
1569	3.745777	1604	3.748398	1639	3.751203
1570	3.745855	1605	3.748521	1640	3.751279
1571	3.745933	1606	3.748633	1641	3.751356
1572	3.746011	1607	3.748730	1642	3.751438
1573	3.746089	1608	3.748808	1643	3.751510
1574	3.746187	1609	3.748885	1644	3.751587
1575	3.746244	1610	3.748962	1645	3.751663
1576	3.746322	1611	3.749040	1646	3.751740
1577	3.746400	1612	3.749117	1647	3.751815
1578	3.746478	1613	3.749195	1648	3.751894
1579	3.746556	1614	3.749272	1649	3.751971
1580	3.746634	1615	3.749349	1650	3.752048
1581	3.746712	1616	3.749427	1651	3.752125
1582	3.746789	1617	3.749504	1652	3.752202
1583	3.746867	1618	3.749581	1653	3.752279
1584	3.746945	1619	3.749659	1654	3.752355
1585	3.747023	1620	3.749736	1655	3.752432
1586	3.747100	1621	3.749813	1656	3.752509
1587	3.747178	1622	3.749890	1657	3.752586
1588	3.747256	1623	3.749968	1658	3.752662
1589	3.747334	1624	3.750045	1659	3.752739
1590	3.747411	1625	3.750122	1660	3.752816
1591	3.747489	1626	3.750199	1661	3.752893
1592	3.747567	1627	3.750276	1662	3.752969
1593	3.747644	1628	3.750354	1663	3.753046
1594	3.747722	1629	3.750431	1664	3.753123
1595	3.747800	1630	3.750508	1665	3.753199
1596	3.747877	1631	3.750585	1666	3.753276
1597	3.747955	1632	3.750662	1667	3.753353
1598	3.748032	1633	3.750739	1668	3.753429
1599	3.748110	1634	3.750816	1669	3.753506
1600	3.748188	1635	3.750893	1670	3.753583

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
5671	3.753	5706	3.75	5741	3.75
5672	3.753	5707	3.75	5742	3.75
5673	3.753	5708	3.75	5743	3.75
5674	3.753	5709	3.75	5744	3.75
5675	3.753	5710	3.75	5745	3.75
5676	3.75	5711	3.75	5746	3.75
5677	3.75	5712	3.75	5747	3.75
5678	3.75	5713	3.75	5748	3.75
5679	3.75	5714	3.75	5749	3.75
5680	3.75	5715	3.75	5750	3.75
5681	3.75	5716	3.75	5751	3.75
5682	3.75	5717	3.75	5752	3.75
5683	3.75	5718	3.75	5753	3.75
5684	3.75	5719	3.75	5754	3.75
5685	3.75	5720	3.75	5755	3.76
5686	3.75	5721	3.75	5756	3.76
5687	3.75	5722	3.75	5757	3.76
5688	3.75	5723	3.75	5758	3.76
5689	3.75	5724	3.75	5759	3.76
5690	3.75	5725	3.75	5760	3.76
5691	3.75	5726	3.75	5761	3.76
5692	3.75	5727	3.75	5762	3.76
5693	3.75	5728	3.75	5763	3.76
5694	3.75	5729	3.75	5764	3.76
5695	3.75	5730	3.75	5765	3.76
5696	3.75	5731	3.75	5766	3.76
5697	3.75	5732	3.75	5767	3.76
5698	3.75	5733	3.75	5768	3.76
5699	3.75	5734	3.75	5769	3.76
5700	3.75	5735	3.75	5770	3.76
5701	3.75	5736	3.75	5771	3.76
5702	3.75	5737	3.75	5772	3.76
5703	3.75	5738	3.75	5773	3.76
5704	3.75	5739	3.75	5774	3.76
5705	3.75	5740	3.75	5775	3.76

Num	Logarithm	Num	Logarithm	Num	Logarithm
5776	3.761627	5811	3.764459	5846	3.7668[illegible]
5777	3.761702	5812	3.764532	5847	3.7669[illegible]
5778	3.761777	5813	3.764604	5848	3.767007
5779	3.761852	5814	3.764678	5849	3.767081
5780	3.761927	5815	3.764749	5850	3.767155
5781	3.762003	5816	3.764824	5851	3.767230
5782	3.762078	5817	3.764899	5852	3.767304
5783	3.762153	5818	3.764973	5853	3.767378
5784	3.762228	5819	3.765048	5854	3.767452
5785	3.762303	5820	3.765120	5855	3.767526
5786	3.762378	5821	3.765197	5856	3.767602
5787	3.762453	5822	3.765272	5857	3.767675
5788	3.762528	5823	3.765346	5858	3.767749
5789	3.762604	5824	3.765421	5859	3.767823
5790	3.762678	5825	3.765495	5860	3.767897
5791	3.762754	5826	3.765570	5861	3.767972
5792	3.762828	5827	3.765645	5862	3.768045
5793	3.762903	5828	3.765719	5863	3.768119
5794	3.762978	5829	3.765794	5864	3.768194
5795	3.763053	5830	3.765868	5865	3.768268
5796	3.763128	5831	3.765943	5866	3.768342
5797	3.763203	5832	3.766018	5867	3.768416
5798	3.763278	5833	3.766092	5868	3.768490
5799	3.763353	5834	3.766166	5869	3.768564
5800	3.763428	5835	3.766240	5870	3.768638
5801	3.763502	5836	3.766315	5871	3.768714
5802	3.763577	5837	3.766389	5872	3.768786
5803	3.763653	5838	3.766464	5873	3.768860
5804	3.763727	5839	3.766538	5874	3.768934
5805	3.763802	5840	3.766612	5875	3.769007
5806	3.763877	5841	3.766687	5876	3.769081
5807	3.763951	5842	3.766761	5877	3.769154
5808	3.764026	5843	3.766835	5878	3.769229
5809	3.764101	5844	3.766910	5879	3.769302
5810	3.764176	5845	3.766984	5880	3.769376

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
5881	3.769681	5916	3.772028	5951	3.774587
5882	3.769731	5917	3.772101	5952	3.774660
5883	3.769780	5918	3.772171	5953	3.774733
5884	3.769829	5919	3.772248	5954	3.774808
5885	3.769876	5920	3.772321	5955	3.774881
5886	3.769926	5921	3.772391	5956	3.774954
5887	3.769974	5922	3.772461	5957	3.775027
5888	3.770067	5923	3.772541	5958	3.775100
5889	3.770041	5924	3.772615	5959	3.775173
5890	3.770115	5925	3.772688	5960	3.775246
5891	3.770189	5926	3.772761	5961	3.775319
5892	3.770261	5927	3.772834	5962	3.775393
5893	3.770336	5928	3.772908	5963	3.775464
5894	3.770410	5929	3.772981	5964	3.775537
5895	3.770482	5930	3.773054	5965	3.775610
5896	3.770557	5931	3.773127	5966	3.775683
5897	3.770631	5932	3.773201	5967	3.775756
5898	3.770704	5933	3.773274	5968	3.775829
5899	3.770778	5934	3.773347	5969	3.775901
5900	3.770852	5935	3.773420	5970	3.775974
5901	3.770925	5936	3.773493	5971	3.776047
5902	3.770999	5937	3.773567	5972	3.776119
5903	3.771041	5938	3.773640	5973	3.776192
5904	3.771176	5939	3.773713	5974	3.776265
5905	3.771219	5940	3.773786	5975	2.776337
5906	3.771293	5941	3.773859	5976	3.776410
5907	3.771367	5942	3.773932	5977	3.776483
5908	3.771440	5943	3.774005	5978	3.776555
5909	3.771514	5944	3.774078	5979	3.776628
5910	3.771587	5945	3.774151	5980	3.776701
5911	1.771661	5946	3.774224	5981	3.776773
5912	3.771734	5947	3.774297	5982	3.776846
5913	3.771807	5948	3.774371	5983	3.776919
5914	3.771880	5949	3.774444	5984	3.776991
5915	3.771954	5950	3.774517	5985	3.777064

Num	Logarithm	Num	Logarithm	Num	Logarithm
5986	3.777138	6013	3.779568	6040	3.781987
5987	3.777209	6014	3.779640	6041	3.782057
5988	3.777281	6015	3.779712	6042	3.782128
5989	3.777352	6016	3.779783	6043	3.782199
5990	3.777424	6017	3.779855	6044	3.782270
5991	3.777495	6018	3.779926	6045	3.782341
5992	3.777567	6019	3.779998	6046	3.782412
5993	3.777638	6020	3.780069	6047	3.782483
5994	3.777710	6021	3.780141	6048	3.782554
5995	3.777781	6022	3.780212	6049	3.782625
5996	3.777853	6023	3.780283	6050	3.782696
5997	3.777924	6024	3.780355	6051	3.782767
5998	3.777996	6025	3.780426	6052	3.782838
5999	3.778068	6026	3.780497	6053	3.782909
6000	3.778139	6027	3.780569	6054	3.782980
6001	3.778211	6028	3.780640	6055	3.783051
6002	3.778282	6029	3.780711	6056	3.783122
6003	3.778354	6030	3.780783	6057	3.783193
6004	3.778425	6031	3.780854	6058	3.783264
6005	3.778497	6032	3.780925	6059	3.783335
6006	3.778568	6033	3.780997	6060	3.783406
6007	3.778640	6034	3.781068	6061	3.783477
6008	3.778711	6035	3.781139	6062	3.783548
6009	3.778783	6036	3.781211	6063	3.783619
6010	3.778854	6037	3.781282	6064	3.783690
6011	3.778926	6038	3.781353	6065	3.783761
6012	3.778997	6039	3.781425	6066	3.783832
6013	3.779069	6040	3.781496	6067	3.783903
6014	3.779140	6041	3.781567	6068	3.783974
6015	3.779212	6042	3.781639	6069	3.784045
6016	3.779283	6043	3.781710	6070	3.784116
6017	3.779355	6044	3.781781	6071	3.784187
6018	3.779426	6045	3.781853	6072	3.784258
6019	3.779498	6046	3.781924	6073	3.784329
6020	3.779569	6047	3.781995	6074	3.784400
		6048	3.782067	6075	3.784471
		6049	3.782138	6076	3.784542
		6050	3.782209	6077	3.784613
		6051	3.782281	6078	3.784684
		6052	3.782352	6079	3.784755
		6053	3.782423	6080	3.784826
		6054	3.782494	6081	3.784897
		6055	3.782566	6082	3.784968
				6083	3.785039
				6084	3.785110
				6085	3.785181
				6086	3.785252
				6087	3.785323
				6088	3.785394
				6089	3.785465
				6090	3.785536

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
6091	3.784688	6126	3.787179	6161	3.789668
6092	3.784713	6127	3.787247	6162	3.789721
6093	3.784831	6128	3.787318	6163	3.789781
6094	3.784902	6129	3.787389	6164	3.789862
6095	3.784973	6130	3.787460	6165	3.789931
6096	3.785043	6131	3.787531	6166	3.790002
6097	3.785116	6132	3.787602	6167	3.790073
6098	3.785187	6133	3.787673	6168	3.790144
6099	3.785258	6134	3.787743	6169	3.790215
6100	3.785329	6135	3.787814	6170	3.790286
6101	3.785401	6136	3.787885	6171	3.790357
6102	3.785472	6137	3.787956	6172	3.790428
6103	3.785543	6138	3.788026	6173	3.790499
6104	3.785614	6139	3.788097	6174	3.790569
6105	3.785685	6140	3.788168	6175	3.790640
6106	3.785756	6141	3.788239	6176	3.790707
6107	3.785827	6142	3.788309	6177	3.790778
6108	3.785898	6143	3.788380	6178	3.790847
6109	3.785970	6144	3.788451	6179	3.790918
6110	3.786040	6145	3.788521	6180	3.790988
6111	3.786112	6146	3.788592	6181	3.791058
6112	3.786183	6147	3.788663	6182	3.791129
6113	3.786254	6148	3.788733	6183	3.791199
6114	3.786325	6149	3.788804	6184	3.791269
6115	3.786396	6150	3.788875	6185	3.791339
6116	3.786467	6151	3.788945	6186	3.791409
6117	3.786538	6152	3.789016	6187	3.791480
6118	3.786609	6153	3.789086	6188	3.791550
6119	3.786680	6154	3.789157	6189	3.791560
6120	3.786751	6155	3.789228	6190	3.791690
6121	3.786822	6156	3.789298	6191	3.791760
6122	3.786893	6157	3.789369	6192	3.791830
6123	3.786964	6158	3.789439	6193	3.791901
6124	3.787035	6159	3.789510	6194	3.791971
6125	3.787106	6160	3.789580	6195	3.792041

Num	Logarithm	Num	Logarithm	Num	Logarithm
6196	3.791112	6231	3.794357	6266	3.796590
6197	3.791181	6232	3.794627	6267	3.797019
6198	3.791251	6233	3.794697	6268	3.797119
6199	3.791321	6234	3.794766	6269	3.797198
6200	3.791391	6235	3.794836	6270	3.797667
6201	3.791461	6236	3.794906	6271	3.797338
6202	3.791531	6237	3.794975	6272	3.797406
6203	3.791601	6238	3.795045	6273	3.797477
6204	3.791671	6239	3.795115	6274	3.797544
6205	3.891741	6240	3.795184	6275	3.797613
6206	3.791811	6241	3.795254	6276	3.797682
6207	3.791881	6242	3.795323	6277	3.797752
6208	3.791951	6243	3.795393	6278	3.797821
6209	3.792021	6244	3.795462	6279	3.797890
6210	3.792091	6245	3.795532	6280	3.797959
6211	3.792161	6246	3.795602	6281	3.798028
6212	3.792231	6247	3.795671	6282	3.798097
6213	3.792301	6248	3.795741	6283	3.798167
6214	3.792371	6249	3.795810	6284	3.798236
6215	3.792441	6250	3.795880	6285	3.798305
6216	3.792511	6251	3.795949	6286	3.798374
6217	3.792580	6252	3.796019	6287	3.798443
6218	3.792650	6253	3.796088	6288	3.798512
6219	3.792720	6254	3.796157	6289	3.798581
6220	3.792790	6255	3.796227	6290	3.798650
6221	3.792860	6256	3.796296	6291	3.798719
6222	3.792930	6257	3.796366	6292	3.798788
6223	3.792999	6258	3.796435	6293	3.798857
6224	3.793069	6259	3.796505	6294	3.798926
6225	3.793139	6260	3.796574	6295	3.798995
6226	3.793209	6261	3.796643	6296	3.799064
6227	3.793278	6262	3.796713	6297	3.799133
6228	3.793348	6263	3.796782	6298	3.799202
6229	3.793418	6264	3.796850	6299	3.799271
6230	3.793488	6265	3.796921	6300	3.799340

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
6301	3.799809	6336	3.801811	6371	3.804289
6302	3.799878	6337	3.801883	6372	3.804297
6303	3.799947	6338	3.801951	6373	3.804365
6304	3.800016	6339	3.802020	6374	3.804433
6305	3.800085	6340	3.802089	6375	3.804501
6306	3.800154	6341	3.802157	6376	3.804569
6307	3.800222	6342	3.802226	6377	3.804638
6308	3.800291	6343	3.802294	6378	3.804706
6309	3.800360	6344	3.802363	6379	3.804774
6310	3.800429	6345	3.802431	6380	3.804842
6311	3.800498	6346	3.802500	6381	3.804911
6312	3.800567	6347	3.802568	6382	3.804979
6313	3.800635	6348	3.802636	6383	3.805047
6314	3.800704	6349	3.802705	6384	3.805115
6315	3.800773	6350	3.802773	6385	3.805183
6316	3.800842	6351	3.802842	6386	3.805252
6317	3.800910	6352	3.802910	6387	3.805320
6318	3.800979	6353	3.802978	6388	3.805388
6319	3.801048	6354	3.803047	6389	3.805456
6320	3.801117	6355	3.803115	6390	3.805525
6321	3.801185	6356	3.803183	6391	3.805593
6322	3.801254	6357	3.803252	6392	3.805661
6323	3.801323	6358	3.803320	6393	3.805729
6324	3.801391	6359	3.803389	6394	3.805797
6325	3.801460	6360	3.803458	6395	3.805866
6326	3.801529	6361	3.803525	6396	3.805934
6327	3.801597	6362	3.803593	6397	3.806002
6328	3.801666	6363	3.803661	6398	3.806070
6329	3.801735	6364	3.803730	6399	3.806138
6330	3.801803	6365	3.803798	6400	3.806207
6331	3.801872	6366	3.803866	6401	3.806275
6332	3.801940	6367	3.803934	6402	3.806343
6333	3.802009	6368	3.804003	6403	3.806411
6334	3.802078	6369	3.804071	6404	3.806479
6335	3.802146	6370	3.804139	6405	3.806547

Num	Logarithm	Num	Logarithm	Num	Logarithm
6406	3.8065280	6441	3.8088353	6476	3.8113061
6407	3.8066654	6442	3.8089020	6477	3.8113731
6408	3.8067722	6443	3.8089688	6478	3.8114401
6409	3.8067790	6444	3.8090355	6479	3.8115068
6410	3.8068858	6445	3.8091022	6480	3.8115735
6411	3.8069925	6446	3.8091690	6481	3.8116402
6412	3.8069993	6447	3.8092357	6482	3.8117069
6413	3.8070061	6448	3.8093025	6483	3.8117736
6414	3.8071129	6449	3.8093692	6484	3.8118403
6415	3.8071196	6450	3.8094359	6485	3.8119070
6416	3.8071264	6451	3.8095027	6486	3.8119736
6417	3.8071332	6452	3.8095694	6487	3.8120403
6418	3.8071399	6453	3.8096361	6488	3.8121070
6419	3.8071467	6454	3.8097029	6489	3.8121737
6420	3.8071535	6455	3.8097696	6490	3.8122404
6421	3.8071602	6456	3.8098363	6491	3.8123071
6422	3.8071670	6457	3.8099030	6492	3.8123738
6423	3.8071737	6458	3.8099698	6493	3.8124405
6424	3.8071805	6459	3.8100365	6494	3.8125072
6425	3.8071872	6460	3.8101032	6495	3.8125739
6426	3.8071940	6461	3.8101699	6496	3.8126406
6427	3.8072008	6462	3.8102367	6497	3.8127072
6428	3.8072075	6463	3.8103034	6498	3.8127739
6429	3.8072143	6464	3.8103701	6499	3.8128406
6430	3.8072211	6465	3.8104368	6500	3.8129073
6431	3.8072278	6466	3.8105036	6501	3.8129740
6432	3.8072346	6467	3.8105702	6502	3.8130407
6433	3.8072413	6468	3.8106370	6503	3.8131073
6434	3.8072481	6469	3.8107037	6504	3.8131740
6435	3.8072548	6470	3.8107704	6505	3.8132407
6436	3.8072616	6471	3.8108371	6506	3.8133074
6437	3.8072683	6472	3.8109038	6507	3.8133740
6438	3.8072751	6473	3.8109705	6508	3.8134407
6439	3.8072818	6474	3.8110372	6509	3.8135074
6440	3.8072885	6475	3.8111039	6510	3.8135741

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
6511	3.813647	6546	3.815976	6581	3.818305
6512	3.813714	6547	3.816042	6582	3.818372
6513	3.813781	6548	3.816108	6583	3.818438
6514	3.813847	6549	3.816175	6584	3.818505
6515	3.813914	6550	3.816241	6585	3.818571
6516	3.813981	6551	3.816307	6586	3.818638
6517	3.814047	6552	3.816373	6587	3.818704
6518	3.814114	6553	3.816440	6588	3.818771
6519	3.814181	6554	3.816506	6589	3.818837
6520	3.814247	6555	3.816572	6590	3.818903
6521	3.814314	6556	3.816638	6591	3.818971
6522	3.814380	6557	3.816705	6592	3.819037
6523	3.814447	6558	3.816771	6593	3.819103
6524	3.814514	6559	3.816837	6594	3.819170
6525	3.814580	6560	3.816903	6595	3.819236
6526	3.814647	6561	3.816970	6596	3.819302
6527	3.814713	6562	3.817036	6597	3.819368
6528	3.814780	6563	3.817102	6598	3.819435
6529	3.814846	6564	3.817168	6599	3.819501
6530	3.814913	6565	3.817234	6600	3.819567
6531	3.814979	6566	3.817300	6601	3.819634
6532	3.815046	6567	3.817367	6602	3.819700
6533	3.815112	6568	3.817433	6603	3.819766
6534	3.815179	6569	3.817499	6604	3.819832
6535	3.815245	6570	3.817565	6605	3.819898
6536	3.815312	6571	3.817631	6606	3.819965
6537	3.815378	6572	3.817697	6607	3.820031
6538	3.815444	6573	3.817763	6608	3.820097
6539	3.815511	6574	3.817829	6609	3.820163
6540	3.815577	6575	3.817895	6610	3.820230
6541	3.815644	6576	3.817961	6611	3.820296
6542	3.815710	6577	3.818027	6612	3.820362
6543	3.815776	6578	3.818093	6613	3.820428
6544	3.815843	6579	3.818159	6614	3.820494
6545	3.815909	6580	3.818225	6615	3.820561

Num	Logarithm	Num	Logarithm	Num	Logarithm
6616	3.8219595	6651	3.8221886	6686	3.8223176
6617	3.8220661	6652	3.8221952	6687	3.8224243
6618	3.8220726	6653	3.8223017	6688	3.8225306
6619	3.8220792	6654	3.8223082	6689	3.8225371
6620	3.8220858	6655	3.8223148	6690	3.8225436
6621	3.8220923	6656	3.8223213	6691	3.8225501
6622	3.8220989	6657	3.8223278	6692	3.8225565
6623	3.8221054	6658	3.8223343	6693	3.8225630
6624	3.8221120	6659	3.8223409	6694	3.8225695
6625	3.8221185	6660	3.8223474	6695	3.8225760
6626	3.8221251	6661	3.8223539	6696	3.8225825
6627	3.8221317	6662	3.8223604	6697	3.8225890
6628	3.8221382	6663	3.8223669	6698	3.8225955
6629	3.8221448	6664	3.8223735	6699	3.8226020
6630	3.8221513	6665	3.8223800	6700	3.8226084
6631	3.8221579	6666	3.8223865	6701	3.8226149
6632	3.8221644	6667	3.8223930	6702	3.8226214
6633	3.8221710	6668	3.8223995	6703	3.8226279
6634	3.8221775	6669	3.8224060	6704	3.8226344
6635	3.8221840	6670	3.8224125	6705	3.8226408
6636	3.8221906	6671	3.8224190	6706	3.8226473
6637	3.8221971	6672	3.8224256	6707	3.8226538
6638	3.8222037	6673	3.8224321	6708	3.8226603
6639	3.8222102	6674	3.8224386	6709	3.8226667
6640	3.8222168	6675	3.8224451	6710	3.8226732
6641	3.8222233	6676	3.8224516	6711	3.8226797
6642	3.8222298	6677	3.8224581	6712	3.8226861
6643	3.8222364	6678	3.8224646	6713	3.8226926
6644	3.8222429	6679	3.8224711	6714	3.8226991
6645	3.8222495	6680	3.8224779	6715	3.8227056
6646	3.8222560	6681	3.8224841	6716	3.8227120
6647	3.8222625	6682	3.8224906	6717	3.8227185
6648	3.8222691	6683	3.8224971	6718	3.8227246
6649	3.8222756	6684	3.8225036	6719	3.8227304
6650	3.8222821	6685	3.8225101	6720	3.8227369

Num	Logarithm	Num	Logarithm	Num	Logarithm
6721	3.8279433	6756	3.8299689	6791	3.8319933
6722	3.8279498	6757	3.8299753	6792	3.8319997
6723	3.8279563	6758	3.8299818	6793	3.8320061
6724	3.8279627	6759	3.8299882	6794	3.8320125
6725	3.8279692	6760	3.8299946	6795	3.8320189
6726	3.8279756	6761	3.8300010	6796	3.8320253
6727	3.8279821	6762	3.8300075	6797	3.8320317
6728	3.8279886	6763	3.8300139	6798	3.8320381
6729	3.8279950	6764	3.8300203	6799	3.8320445
6730	3.8280015	6765	3.8300267	6800	3.8320508
6731	3.8280079	6766	3.8300332	6801	3.8320572
6732	3.8280144	6767	3.8300396	6802	3.8320636
6733	3.8280208	6768	3.8300460	6803	3.8320700
6734	3.8280273	6769	3.8300524	6804	3.8320764
6735	3.8280337	6770	3.8300588	6805	3.8320828
6736	3.8280402	6771	3.8300652	6806	3.8320891
6737	3.8280466	6772	3.8300716	6807	3.8320955
6738	3.8280531	6773	3.8300781	6808	3.8321019
6739	3.8280595	6774	3.8300845	6809	3.8321083
6740	3.8280659	6775	3.8300909	6810	3.8321147
6741	3.8280724	6776	3.8300973	6811	3.8321210
6742	3.8280788	6777	3.8301037	6812	3.8321274
6743	3.8280853	6778	3.8301101	6813	3.8321338
6744	3.8280917	6779	3.8301165	6814	3.8321402
6745	3.8280981	6780	3.8301229	6815	3.8321465
6746	3.8281046	6781	3.8301293	6816	3.8321529
6747	3.8281110	6782	3.8301357	6817	3.8321593
6748	3.8281174	6783	3.8301421	6818	3.8321657
6749	3.8281239	6784	3.8301485	6819	3.8321720
6750	3.8281303	6785	3.8301549	6820	3.8321784
6751	3.8281368	6786	3.8301613	6821	3.8321848
6752	3.8281432	6787	3.8301677	6822	3.8321911
6753	3.8281496	6788	3.8301741	6823	3.8321975
6754	3.8281561	6789	3.8301805	6824	3.8322039
6755	3.8281625	6790	3.8301869	6825	3.8322102

Num	Logarithm	Num	Logarithm	Num	Logarithm
6826	3.834166	6861	3.836127	6896	3.838597
6827	3.834219	6862	3.836450	6897	3.838660
6828	3.834293	6863	3.836514	6898	3.838723
6829	3.834357	6864	3.836577	6899	3.838786
6830	3.834420	6865	3.836640	6900	3.838849
6831	3.834484	6866	3.836703	6901	3.838912
6832	3.834547	6867	3.836767	6902	3.838975
6833	3.834611	6868	3.836830	6903	3.839037
6834	3.834675	6869	3.836893	6904	3.839100
6835	3.834738	6870	3.836957	6905	3.839163
6836	3.834802	6871	3.837019	6906	3.839226
6837	3.834865	6872	3.837083	6907	3.839289
6838	3.834929	6873	3.837146	6908	3.839353
6839	3.834992	6874	3.837209	6909	3.839415
6840	3.835056	6875	3.837273	6910	3.839478
6841	3.835119	6876	3.837335	6911	3.839540
6842	3.835183	6877	3.837399	6912	3.839603
6843	3.835246	6878	3.837462	6913	3.839666
6844	3.835310	6879	3.837525	6914	3.839729
6845	3.835373	6880	3.837588	6915	3.839792
6846	3.835436	6881	3.837651	6916	3.839855
6847	3.835500	6882	3.837714	6917	3.839917
6848	3.835563	6883	3.837777	6918	3.839980
6849	3.835627	6884	3.837840	6919	3.840043
6850	3.835690	6885	3.837903	6920	3.840106
6851	3.835754	6886	3.837967	6921	3.840168
6852	3.835817	6887	3.838030	6922	3.840231
6853	3.835880	6888	3.838093	6923	3.840294
6854	3.835944	6889	3.838156	6924	3.840357
6855	3.836007	6890	3.838219	6925	3.840419
6856	3.836070	6891	3.838282	6926	3.840482
6857	3.836134	6892	3.838345	6927	3.840545
6858	3.836197	6893	3.838408	6928	3.840607
6859	3.836260	6894	3.838471	6929	3.840670
6860	3.836324	6895	3.838534	6930	3.840733

Num.	Logarithmi	Num.	Logarithmi	Num.	Logarithmi
6931	3.840795	6966	3.842983	7001	3.845146
6932	3.840858	6967	3.843045	7002	3.845208
6933	3.840921	6968	3.843108	7003	3.845270
6934	3.840983	6969	3.843170	7004	3.845332
6935	3.841046	6970	3.843232	7005	3.845394
6936	3.841109	6971	3.843295	7006	3.845456
6937	3.841171	6972	3.843357	7007	3.845518
6938	3.841234	6973	3.843419	7008	3.845580
6939	3.841296	6974	3.843481	7009	3.845642
6940	3.841359	6975	3.843544	7010	3.845704
6941	3.841422	6976	3.843606	7011	3.845766
6942	3.841484	6977	3.843668	7012	3.845828
6943	3.841547	6978	3.843731	7013	3.845890
6944	3.841609	6979	3.843793	7014	3.845952
6945	3.841672	6980	3.843855	7015	3.846014
6946	3.841734	6981	3.843917	7016	3.846076
6947	3.841797	6982	3.843979	7017	3.846138
6948	3.841859	6983	3.844042	7018	3.846200
6949	3.841922	6984	3.844104	7019	3.846262
6950	3.841984	6985	3.844166	7020	3.846324
6951	3.842047	6986	3.844228	7021	3.846386
6952	3.842109	6987	3.844290	7022	3.846448
6953	3.842172	6988	3.844352	7023	3.846510
6954	3.842234	6989	3.844415	7024	3.846572
6955	3.842297	6990	3.844477	7025	3.846634
6956	3.842359	6991	3.844539	7026	3.846696
6957	3.842422	6992	3.844601	7027	3.846758
6958	3.842484	6993	3.844663	7028	3.846820
6959	3.842546	6994	3.844725	7029	3.846882
6960	3.842609	6995	3.844787	7030	3.846944
6961	3.842671	6996	3.844849	7031	3.847006
6962	3.842734	6997	3.844911	7032	3.847068
6963	3.842796	6998	3.844973	7033	3.847130
6964	3.842858	6999	3.845036	7034	3.847192
6965	3.842921	7000	3.845098	7035	3.847254

Num	Logarithm	Num	Logarithm	Num	Logarithm
7036	3.847325	7071	3.849480	7106	3.851615
7037	3.847387	7072	3.849542	7107	3.851684
7038	3.847449	7073	3.849603	7108	3.851747
7039	3.847511	7074	3.849665	7109	3.851808
7040	3.847572	7075	3.849726	7110	3.851869
7041	3.847634	7076	3.849787	7111	3.851930
7042	3.847696	7077	3.849849	7112	3.851991
7043	3.847757	7078	3.849910	7113	3.852052
7044	3.847819	7079	3.849971	7114	3.852113
7045	3.847881	7080	3.850033	7115	3.852174
7046	3.847942	7081	3.850094	7116	3.852235
7047	3.848004	7082	3.850155	7117	3.852297
7048	3.848065	7083	3.850217	7118	3.852358
7049	3.848127	7084	3.850278	7119	3.852419
7050	3.848189	7085	3.850339	7120	3.852480
7051	3.848250	7086	3.850401	7121	3.852541
7052	3.848312	7087	3.850462	7122	3.852602
7053	3.848373	7088	3.850523	7123	3.852663
7054	3.848435	7089	3.850585	7124	3.852723
7055	3.848497	7090	3.850646	7125	3.852784
7056	3.848558	7091	3.850707	7126	3.852845
7057	3.848620	7092	3.850768	7127	3.852906
7058	3.848681	7093	3.850830	7128	3.852967
7059	3.848743	7094	3.850891	7129	3.853028
7060	3.848804	7095	3.850952	7130	3.853089
7061	3.848866	7096	3.851013	7131	3.853150
7062	3.848927	7097	3.851074	7132	3.853211
7063	3.848989	7098	3.851136	7133	3.853272
7064	3.849050	7099	3.851197	7134	3.853333
7065	3.849112	7100	3.851258	7135	3.853394
7066	3.849173	7101	3.851319	7136	3.853454
7067	3.849235	7102	3.851381	7137	3.853515
7068	3.849296	7103	3.851441	7138	3.853576
7069	3.849358	7104	3.851503	7139	3.853637
7070	3.849419	7105	3.851564	7140	3.853698

Num	Logarithm	Num	Logarithm	Num	Logarithm
7141	3.8537759	7176	3.8555882	7211	3.8574004
7142	3.8537819	7177	3.8555942	7212	3.8574065
7143	3.8537880	7178	3.8556003	7213	3.8574125
7144	3.8537941	7179	3.8556064	7214	3.8574186
7145	3.8554002	7180	3.8556124	7215	3.8574246
7146	3.8554063	7181	3.8556182	7216	3.8574306
7147	3.8554123	7182	3.8556245	7217	3.8574367
7148	3.8554184	7183	3.8556305	7218	3.8574426
7149	3.8554245	7184	3.8556366	7219	3.8574487
7150	3.8554306	7185	3.8556426	7220	3.8574547
7151	3.8554366	7186	3.8556487	7221	3.8574607
7152	3.8554426	7187	3.8556547	7222	3.8574667
7153	3.8554488	7188	3.8556603	7223	3.8574727
7154	3.8554548	7189	3.8556668	7224	3.8574787
7155	3.8554609	7190	3.8556728	7225	3.8574847
7156	3.8554670	7191	3.8556789	7226	3.8574908
7157	3.8554731	7192	3.8556849	7227	3.8574968
7158	3.8554791	7193	3.8556910	7228	3.8575028
7159	3.8554852	7194	3.8556970	7229	3.8575088
7160	3.8554913	7195	3.8557030	7230	3.8575148
7161	3.8554973	7196	3.8557091	7231	3.8575208
7162	3.8555034	7197	3.8557151	7232	3.8575268
7163	3.8555094	7198	3.8557211	7233	3.8575328
7164	3.8555155	7199	3.8557272	7234	3.8575388
7165	3.8555216	7200	3.8557332	7235	3.8575448
7166	3.8555276	7201	3.8557392	7236	3.8575508
7167	3.8555337	7202	3.8557453	7237	3.8575568
7168	3.8555398	7203	3.8557513	7238	3.8575628
7169	3.8555458	7204	3.8557573	7239	3.8575688
7170	3.8555519	7205	3.8557634	7240	3.8575748
7171	3.8555579	7206	3.8557694	7241	3.8575808
7172	3.8555640	7207	3.8557754	7242	3.8575868
7173	3.8555700	7208	3.8557814	7243	3.8575928
7174	3.8555761	7209	3.8557875	7244	3.8575988
7175	3.8555821	7210	3.8557935	7245	3.8576048

Num.	Logarithm	Num.	Logarithm	Num.	Logarithm
7246	3.860098	7281	3.862191	7316	3.864273
7247	3.860158	7282	3.862250	7317	3.864333
7248	3.860218	7283	3.862310	7318	3.864392
7249	3.860278	7284	3.862369	7319	3.864452
7250	3.860338	7285	3.862429	7320	3.864511
7251	3.860397	7286	3.862489	7321	3.864570
7252	3.860457	7287	3.862548	7322	3.864629
7253	3.860517	7288	3.862608	7323	3.864689
7254	3.860577	7289	3.862667	7324	3.864748
7255	3.860637	7290	3.862727	7325	3.864807
7256	3.860697	7291	3.862787	7326	3.864866
7257	3.860757	7292	3.862846	7327	3.864926
7258	3.860817	7293	3.862906	7328	3.864985
7259	3.860876	7294	3.862965	7329	3.865044
7260	3.860936	7295	3.863025	7330	3.865104
7261	3.860996	7296	3.863084	7331	3.865163
7262	3.861056	7297	3.863144	7332	3.865222
7263	3.861116	7298	3.863203	7333	3.865281
7264	3.861175	7299	3.863263	7334	3.865340
7265	3.861235	7300	3.863322	7335	3.865400
7266	3.861295	7301	3.863381	7336	3.865459
7267	3.861355	7302	3.863441	7337	3.865518
7268	3.861414	7303	3.863501	7338	3.865577
7269	3.861474	7304	3.863560	7339	3.865636
7270	3.861534	7305	3.863620	7340	3.865696
7271	3.861594	7306	3.863679	7341	3.865755
7272	3.861653	7307	3.863739	7342	3.865814
7273	3.861713	7308	3.863798	7343	3.865873
7274	3.861773	7309	3.863858	7344	3.865932
7275	3.861833	7310	3.863917	7345	3.865991
7276	3.861892	7311	3.863976	7146	3.866050
7277	3.861952	7312	3.864036	7347	3.866110
7278	3.862012	7313	3.864095	7348	3.866169
7279	3.862071	7314	3.864155	7349	3.866228
7280	3.862131	7315	3.864214	7350	3.866287

Num	Logarithm	Num	Logarithm	Num	Logarithm
7351	3.866396	7386	3.868409	7421	3.870462
7352	3.866405	7387	3.868468	7422	3.870510
7353	3.866464	7388	3.868526	7423	3.870579
7354	3.866523	7389	3.868585	7424	3.870638
7355	3.866582	7390	3.868644	7425	3.870696
7356	3.866641	7391	3.868703	7426	3.870754
7357	3.866700	7392	3.868761	7427	3.870813
7358	3.866759	7393	3.868820	7428	3.870871
7359	3.866818	7394	3.868879	7429	3.870930
7360	3.866876	7395	3.868938	7430	3.870988
7361	3.866936	7396	3.868996	7431	3.871047
7362	3.866995	7397	3.869055	7432	3.871105
7363	3.867054	7398	3.869114	7433	3.871164
7364	3.867111	7399	3.869173	7434	3.871222
7365	3.867172	7400	3.869231	7435	3.871281
7366	3.867231	7401	3.869290	7436	3.871339
7367	3.867290	7402	3.869349	7437	3.871397
7368	3.867349	7403	3.869407	7438	3.871456
7369	3.867408	7404	3.869469	7439	3.871514
7370	3.867466	7405	3.869525	7440	3.871572
7371	3.867525	7406	3.869583	7441	3.871631
7372	3.867585	7407	3.869642	7442	3.871689
7373	3.867644	7408	3.869701	7443	3.871748
7374	3.867703	7409	3.869759	7444	3.871806
7375	3.867762	7410	3.869818	7445	3.871864
7376	3.867820	7411	3.869876	7446	3.871923
7377	3.867879	7412	3.869935	7447	3.871981
7378	3.867938	7413	3.869994	7448	3.872039
7379	3.867997	7414	3.870052	7449	3.872098
7380	3.868056	7415	3.870111	7450	3.872156
7381	3.868115	7316	3.870169	7451	3.872214
7382	3.868174	7317	3.870228	7452	3.872272
7383	3.868232	7318	3.870286	7453	3.872331
7384	3.868291	7319	3.870345	7454	3.872389
7385	3.868350	7320	3.870403	7455	3.872447

Num	Logarithm	Num	Logarithm	Num	Logarithm
7456	3.872505	7491	3.874539	7526	3.876564
7457	3.872564	7492	3.874597	7527	3.876621
7458	3.872622	7493	3.874655	7528	3.876679
7459	3.872680	7494	3.874713	7529	3.876737
7460	3.872738	7495	3.874771	7530	3.876795
7461	3.872797	7496	3.874829	7531	3.876852
7462	3.872855	7497	3.874887	7532	3.876910
7463	3.872913	7498	3.874945	7533	3.876968
7464	3.872971	7499	3.875003	7534	3.877026
7465	3.873029	7500	3.875061	7535	3.877083
7466	3.873088	7501	3.875119	7536	3.877140
7467	3.873146	7502	3.875177	7537	3.877198
7468	3.873204	7503	3.875234	7538	3.877256
7469	3.873262	7504	3.875292	7539	3.877313
7470	3.873320	7505	3.875350	7540	3.877371
7471	3.873378	7506	3.875408	7541	3.877428
7472	3.873436	7507	3.875466	7542	3.877486
7473	3.873495	7508	3.875524	7543	3.877544
7474	3.873553	7509	3.875582	7544	3.877601
7475	3.873611	7510	3.875640	7545	3.877659
7476	3.873669	7511	3.875697	7546	3.877716
7477	3.873727	7512	3.875755	7547	3.877774
7478	3.873785	7513	3.875813	7548	3.877831
7479	3.873843	7514	3.875871	7549	3.877889
7480	3.873901	7515	3.875929	7550	3.877946
7481	3.873959	7516	3.875986	7551	3.878004
7482	3.874017	7517	3.876044	7552	3.878061
7483	3.874075	7518	3.876102	7553	3.878119
7484	3.874133	7519	3.876160	7554	3.878177
7485	3.874190	7520	3.876217	7555	3.878234
7486	3.874249	7521	3.876275	7556	3.878291
7487	3.874307	7522	3.876333	7557	3.878349
7488	3.874365	7523	3.876391	7558	3.878406
7489	3.874423	7524	3.876448	7559	3.878464
7490	3.874481	7525	3.876506	7560	3.878520

Num.	Logarithm.	Num.	Logarithm.	Num.	Logarithm.
7561	3.8781378	7596	3.8805113	7631	3.8828783
7562	3.8786836	7597	3.8806422	7632	3.8826034
7563	3.8786894	7598	3.8806599	7633	3.8826091
7564	3.8787751	7599	3.8806756	7634	3.8827950
7565	3.8788808	7600	3.8808823	7635	3.8828809
7566	3.8788866	7601	3.8808870	7636	3.8828867
7567	3.8789923	7602	3.8809927	7637	3.8829926
7568	3.8789981	7603	3.8809985	7638	3.8829984
7569	3.8790038	7604	3.8811042	7639	3.8831043
7570	3.8790095	7605	3.8811099	7640	3.8831099
7571	3.8790153	7606	3.8811156	7641	3.8831156
7572	3.8790210	7607	3.8811213	7642	3.8831213
7573	3.8790268	7608	3.8811270	7643	3.8831283
7574	3.8790325	7609	3.8811327	7644	3.8831320
7575	3.8790382	7610	3.8811384	7645	3.8831377
7576	3.8790440	7611	3.8811441	7646	3.8831434
7577	3.8790497	7612	3.8811498	7647	3.8831491
7578	3.8790554	7613	3.8811555	7648	3.8831547
7579	3.8790611	7614	3.8811612	7649	3.8831604
7580	3.8790669	7615	3.8811669	7650	3.8831661
7581	3.8790726	7616	3.8811726	7651	3.8831718
7582	3.8790783	7617	3.8811784	7652	3.8831775
7583	3.8790841	7618	3.8811841	7653	3.8831831
7584	3.8790898	7619	3.8811898	7654	3.8831888
7585	3.8790955	7620	3.8811955	7655	3.8831945
7586	3.8800012	7621	3.8812012	7656	3.8834001
7587	3.8800070	7622	3.8812068	7657	3.8834058
7588	3.8801127	7623	3.8812125	7658	3.8834115
7589	3.8801184	7624	3.8812182	7659	3.8834172
7590	3.8801241	7625	3.8812239	7660	3.8834228
7591	3.8801299	7626	3.8812295	7661	3.8834285
7592	3.8801356	7627	3.8812353	7662	3.8834342
7593	3.8801413	7628	3.8812410	7663	3.8834398
7594	3.8801470	7629	3.8812467	7664	3.8834455
7595	3.8801527	7630	3.8812524	7665	3.8834512

Num	Logarithm	Num	Logarithm	Num	Logarithm
7666	3.884562	7701	3.886547	7736	3.888396
7667	3.884625	7702	3.886603	7737	3.888452
7668	3.884682	7703	3.886659	7738	3.888508
7669	3.884738	7704	3.886716	7739	3.888564
7670	3.884795	7705	3.886772	7740	3.888621
7671	3.884851	7706	3.886829	7741	3.888677
7672	3.884908	7707	3.886885	7742	3.888733
7673	3.884965	7708	3.886941	7743	3.888789
7674	3.885021	7709	3.886998	7744	3.888845
7675	3.885078	7710	3.887054	7745	3.888902
7676	3.885135	7711	3.887110	7746	3.888958
7677	3.885191	7712	3.887167	7747	3.889014
7678	3.885248	7713	3.887223	7748	3.889070
7679	3.885304	7714	3.887279	7749	3.889126
7680	3.885361	7715	3.887336	7750	3.889183
7681	3.885417	7716	3.887392	7751	3.889239
7682	3.885474	7717	3.887448	7752	3.889295
7683	3.885530	7718	3.887504	7753	3.889351
7684	3.885587	7719	3.887561	7754	3.889408
7685	3.885643	7720	3.887617	7755	3.889464
7686	3.885700	7721	3.887673	7756	3.889520
7687	3.885756	7722	3.887729	7757	3.889576
7688	3.885813	7723	3.887786	7758	3.889633
7689	3.885869	7724	3.887842	7759	3.889689
7690	3.885926	7725	3.887898	7760	3.889745
7691	3.885982	7726	3.887954	7761	3.889801
7692	3.886039	7727	3.888010	7762	3.889857
7693	3.886095	7728	3.888067	7763	3.890029
7694	3.886152	7729	3.888123	7764	3.890085
7695	3.886208	7730	3.888179	7765	3.890141
7696	3.886265	7731	3.888235	7766	3.890197
7697	3.886321	7732	3.888291	7767	3.890253
7698	3.886377	7733	3.888348	7768	3.890309
7699	3.886434	7734	3.888404	7769	3.890365
7700	3.886490	7735	3.888460	7770	3.890421

Num	Logarithm	Num	Logarithm	Num	Logarithm
7771	3.890476	7806	3.892418	7841	3.894371
7772	3.890532	7807	3.892484	7842	3.894426
7773	3.890588	7808	3.892539	7843	3.894482
7774	3.890644	7809	3.892595	7844	3.894537
7775	3.890700	7810	3.892651	7845	3.894593
7776	3.890756	7811	3.892706	7846	3.894648
7777	3.890812	7812	3.892762	7847	3.894703
7778	3.890867	7813	3.892817	7848	3.894759
7779	3.890923	7814	3.892873	7849	3.894814
7780	3.890979	7815	3.892929	7850	3.894869
7781	3.891035	7816	3.892984	7851	3.894925
7782	3.891091	7817	3.893040	7852	3.894980
7783	3.891147	7818	3.893095	7853	3.895035
7784	3.891202	7819	3.893151	7854	3.895090
7785	3.891258	7820	3.893206	7855	3.895146
7786	3.891314	7821	3.893262	7856	3.895201
7787	3.891370	7822	3.893317	7857	3.895256
7788	3.891425	7823	3.893373	7858	3.895312
7789	3.891481	7824	3.893428	7859	3.895367
7790	3.891537	7825	3.893484	7860	3.895422
7791	3.891593	7826	3.893539	7861	3.895477
7792	3.891648	7827	3.893595	7862	3.895533
7793	3.891704	7828	3.893650	7863	3.895588
7794	3.891760	7829	3.893706	7864	3.895643
7795	3.891815	7830	3.893761	7865	3.895698
7796	3.891871	7831	3.893817	7866	3.895753
7797	3.891927	7832	3.893872	7867	3.895809
7798	3.891983	7833	3.893928	7868	3.895864
7799	3.892038	7834	3.893983	7869	3.895919
7800	3.892094	7835	3.894010	7870	3.895974
7801	3.892150	7836	3.894094	7871	3.896029
7802	3.892205	7837	3.894149	7872	3.896085
7803	3.892261	7838	3.894205	7873	3.896140
7804	3.892317	7839	3.894260	7874	3.896195
7805	3.892372	7840	3.894316	7875	3.896250

Num	Logaritkm	Num	Logaritkm	Num	Logaritkm
7876	3.896805	7911	3.898131	7946	3.900148
7877	3.896360	7912	3.898286	7947	3.900203
7878	3.896416	7913	3.898341	7948	3.900257
7879	3.896471	7914	3.898396	7949	3.900312
7880	3.896526	7915	3.898450	7950	3.900367
7881	3.896581	7916	3.898505	7951	3.900421
7882	3.896636	7917	3.898560	7952	3.900476
7883	3.896691	7918	3.898615	7953	3.900531
7884	3.896746	7919	3.898670	7954	3.900585
7885	3.896801	7920	3.898725	7954	3.900640
7886	3.896856	7921	3.898780	7956	3.900695
7887	3.896911	7922	3.898834	7957	3.900749
7888	3.896966	7923	3.898889	7958	3.900804
7889	3.897021	7924	3.898944	7959	3.900858
7890	3.897077	7925	3.898999	7960	3.900913
7891	3.897132	7926	3.899054	7961	3.900967
7892	3.897187	7927	3.899108	7962	3.901022
7893	3.897242	7928	3.899163	7963	3.901076
7894	3.897297	7929	3.899218	7964	3.901131
7895	3.897352	7930	3.899273	7965	3.901185
7896	3.897407	7931	3.899327	7966	3.901240
7897	3.897462	7932	3.899382	7967	3.901294
7898	3.897517	7933	3.899437	7968	3.901349
7899	3.897572	7934	3.899492	7969	3.901403
7900	3.897627	7935	3.899546	7970	3.901458
7901	3.897682	7936	3.899601	7971	3.901512
7902	3.897737	7937	3.899656	7972	3.901567
7903	3.897792	7938	3.899711	7973	3.901621
7904	3.897846	7939	3.899765	7974	3.901676
7905	3.897901	7940	3.899820	7975	3.901730
7905	3.897956	7941	3.899875	7976	3.901785
7907	3.898011	7942	3.899929	7977	3.901839
7908	3.898066	7943	3.899984	7978	3.901894
7909	3.898121	7944	3.900039	7979	3.901948
7910	3.898176	7945	3.900093	7980	3.902003

Num	Logarithm	Num	Logarithm	Num	Logarithm
7981	3.901957	8016	3.903957	8051	3.905893
7982	3.902111	8017	3.904011	8052	3.905903
7983	3.902166	8018	3.904066	8053	3.905957
7984	3.902220	8019	3.904120	8054	3.906011
7985	3.902274	8020	3.904174	8055	3.906065
7986	3.902329	8021	3.904228	8056	3.906119
7987	3.902383	8022	3.904282	8057	3.906173
7988	3.902438	8023	3.904336	8058	3.906227
7989	3.902492	8024	3.904390	8059	3.906281
7990	3.902546	8025	3.904445	8060	3.906335
7991	3.902601	8026	3.904499	8061	3.906388
7992	3.902655	8027	3.904553	8062	3.906442
7993	3.902709	8028	3.904607	8063	3.906496
7994	3.902764	8029	3.904661	8064	3.906550
7995	3.902818	8030	3.904715	8065	3.906604
7996	3.902872	8031	3.904769	8066	3.906658
7997	3.902927	8032	3.904823	8067	3.906712
7998	3.902981	8033	3.904877	8068	3.906765
7999	3.903035	8034	3.904931	8069	3.906819
8000	3.903090	8035	3.904985	8070	3.906873
8001	3.903144	8036	3.905039	8071	3.906927
8002	3.903198	8037	3.905094	8072	3.906981
8003	3.903252	8038	3.905148	8073	3.907035
8004	3.903307	8039	3.905202	8074	3.907088
8005	3.903361	8040	3.905256	8075	3.907142
8006	3.903415	8041	3.905310	8076	3.907196
8007	3.903469	8042	3.905364	8077	3.907250
8008	3.903524	8043	3.905418	8078	3.907303
8009	3.903578	8044	3.905472	8079	3.907357
8010	3.903633	8045	3.905526	8080	3.907411
8011	3.903686	8046	3.905580	8081	3.907465
8012	3.903740	8047	3.905634	8082	3.907518
8013	3.903795	8048	3.905688	8083	3.907572
8014	3.903849	8049	3.905742	8084	3.907626
8015	3.903903	8050	3.905796	8085	3.907680

Num	Logaritkm	Num	Logaritkm	Num	Logaritkm
8086	3.9077533	8121	3.909609	8156	3.9114477
8087	3.9077887	8122	3.909663	8157	3.9113530
8088	3.9078241	8123	3.9097716	8158	3.9112583
8089	3.9078594	8124	3.9097769	8159	3.9112636
8090	3.9078948	8125	3.9097823	8160	3.9112690
8091	3.9079302	8126	3.9097876	8161	3.9112743
8092	3.9079656	8127	3.9097930	8162	3.9112796
8093	3.9080109	8128	3.9097983	8163	3.9112849
8094	3.9080463	8129	3.9100037	8164	3.9112903
8095	3.9080816	8130	3.9100090	8165	3.9112956
8096	3.9081170	8131	3.9100144	8166	3.9113009
8097	3.9081524	8132	3.9100197	8167	3.9113062
8098	3.9081877	8133	3.9100251	8168	3.9113115
8099	3.9082231	8134	3.9100304	8169	3.9113168
8100	3.9082585	8135	3.9100357	8170	3.9113222
8101	3.9082938	8136	3.9100411	8171	3.9113275
8102	3.9083292	8137	3.9100464	8172	3.9113328
8103	3.9083645	8138	3.9100517	8173	3.9113381
8104	3.9083999	8139	3.9100571	8174	3.9113434
8105	3.9084353	8140	3.9100624	8175	3.9113487
8106	3.9084706	8141	3.9100677	8176	3.9113540
8107	3.9085060	8142	3.9100731	8177	3.9113594
8108	3.9085413	8143	3.9100784	8178	3.9113647
8109	3.9085767	8144	3.9100837	8179	3.9113700
8110	3.9086120	8145	3.9100891	8180	3.9113753
8111	3.9086474	8146	3.9100944	8181	3.9113806
8112	3.9086827	8147	3.9100997	8182	3.9113859
8113	3.9087181	8148	3.9101051	8183	3.9113912
8114	3.9087534	8149	3.9101104	8184	3.9113965
8115	3.9087888	8150	3.9101157	8185	3.9114018
8116	3.9088241	8151	3.9101210	8186	3.9114071
8117	3.9088595	8152	3.9101264	8187	3.9114124
8118	3.9088948	8153	3.9101317	8188	3.9114177
8119	3.9089302	8154	3.9101370	8189	3.9114230
8120	3.9089656	8155	3.9101424	8190	3.9114283

Num	Logarithm	Num	Logarithm	Num	Logarithm
8191	3.913336	8226	3.915188	8261	3.917038
8192	3.913389	8227	3.915241	8262	3.917091
8193	3.913443	8228	3.915294	8263	3.917137
8194	3.913496	8229	3.915347	8264	3.917190
8195	3.913549	8230	3.915399	8265	3.917243
8196	3.913601	8231	3.915452	8266	3.917295
8197	3.913654	8232	3.915505	8267	3.917347
8198	3.913707	8233	3.915558	8268	3.917400
8199	3.913760	8234	3.915610	8269	3.917453
8200	3.913813	8235	3.915663	8270	3.917505
8201	3.913866	8236	3.915716	8271	3.917558
8202	3.913919	8237	3.915769	8272	3.917610
8203	3.913972	8238	3.915821	8273	3.917663
8204	3.914025	8239	3.915874	8274	3.917715
8205	3.914078	8240	3.915927	8275	3.917768
8206	3.914131	8241	3.915979	8276	3.917820
8207	3.914184	8242	3.916032	8277	3.917873
8208	3.914237	8243	3.916085	8278	3.917925
8209	3.914290	8244	3.916138	8279	3.917977
8210	3.914343	8245	3.916190	8280	3.918030
8211	3.914396	8246	3.916243	8281	3.918082
8212	3.914448	8249	3.916296	8282	3.918135
8213	3.914501	8248	3.916448	8283	3.918187
8214	3.914554	8249	3.916301	8284	3.918240
8215	3.914607	8250	3.916453	8285	3.918292
8216	3.914660	8251	3.916606	8286	3.918345
8217	3.914713	8252	3.916559	8287	3.918397
8218	3.914766	8253	3.916611	8288	3.918449
8219	3.914819	8254	3.916764	8289	3.918502
8220	3.914871	8255	3.916717	8290	3.918554
8221	3.914924	8256	3.916769	8291	3.918606
8222	3.914977	8257	3.916822	8292	3.918659
8223	3.915030	8258	3.916874	8293	3.918711
8224	3.915083	8259	3.916927	8294	3.918764
8225	3.915135	8260	3.916980	8295	3.918816

Num	Logarithm	Num	Logarithm	Num	Logarithm
8296	3.918868	8331	3.920697	8366	3.921517
8297	3.918921	8332	3.920749	8367	3.921569
8298	3.918973	8333	3.920801	8368	3.921621
8299	3.919025	8334	3.920853	8369	3.921673
8300	3.919078	8335	3.920905	8370	3.921725
8301	3.919130	8336	3.920957	8371	3.921777
8302	3.919182	8337	3.921009	8372	3.921829
8303	3.919235	8338	3.921061	8373	3.921881
8304	3.919287	8339	3.921114	8374	3.921933
8305	3.919339	8340	3.921169	8375	3.921984
8306	3.919391	8341	3.921478	8376	3.923036
8307	3.919444	8342	3.921530	8377	3.923088
8308	3.919496	8343	3.921582	8378	3.923140
8309	3.919548	8344	3.921634	8379	3.923192
8310	3.919601	8345	3.921686	8380	3.923244
8311	3.919653	8346	3.921738	8381	3.923295
8312	3.919705	8347	3.921790	8382	3.923347
8313	3.919757	8348	3.921842	8383	3.923399
8314	3.919810	8349	3.921894	8384	3.923451
8315	3.919862	8350	3.921946	8385	3.923503
8316	3.919914	8351	3.921738	8386	3.923554
8317	3.919966	8352	3.921790	8387	3.923606
8318	3.920018	8353	3.921842	8388	3.923658
8319	3.920071	8354	3.921894	8389	3.923710
8320	3.920123	8355	3.921946	8390	3.923762
8321	3.920175	8356	3.921998	8391	3.923813
8322	3.920227	8357	3.922050	8392	3.923865
8323	3.920279	8358	3.922102	8393	3.923917
8324	3.920332	8359	3.922154	8394	3.923969
8325	3.920384	8360	3.922206	8395	3.924020
8326	3.920436	8361	3.922258	8396	3.924072
8327	3.920488	8362	3.922310	8397	3.924124
8328	3.920540	8363	3.922361	8398	3.924175
8329	3.920592	8364	3.922414	8399	3.924227
8330	3.920645	8365	3.922465	8400	3.924279

Num	Logarithm	Num	Logarithm	Num	Logarithm
8401	3.9124331	8436	3.9261736	8471	3.9273914
8402	3.9124382	8437	3.9261888	8472	3.9273964
8403	3.9124434	8438	3.9262039	8473	3.9274015
8404	3.9124486	8439	3.9262191	8474	3.9274065
8405	3.9124537	8440	3.9262342	8475	3.9274115
8406	3.9124589	8441	3.9262493	8476	3.9274166
8407	3.9124641	8442	3.9262645	8477	3.9274216
8408	3.9124692	8443	3.9262796	8478	3.9274267
8409	3.9124744	8444	3.9262948	8479	3.9274317
8410	3.9124796	8445	3.9263099	8480	3.9274367
8411	3.9124847	8446	3.9263251	8481	3.9274418
8412	3.9124899	8447	3.9263402	8482	3.9274468
8413	3.9124950	8448	3.9263553	8483	3.9274519
8414	3.9125002	8449	3.9263705	8484	3.9274569
8415	3.9125054	8450	3.9263856	8485	3.9274619
8416	3.9125105	8451	3.9264008	8486	3.9274670
8417	3.9125157	8452	3.9264159	8487	3.9274720
8418	3.9125208	8453	3.9264310	8488	3.9274771
8419	3.9125260	8454	3.9264462	8489	3.9274821
8420	3.9125312	8455	3.9264613	8490	3.9274871
8421	3.9125363	8456	3.9264765	8491	3.9274922
8422	3.9125415	8457	3.9264916	8492	3.9274972
8423	3.9125466	8458	3.9265067	8493	3.9275023
8424	3.9125518	8459	3.9265219	8494	3.9275073
8425	3.9125569	8460	3.9265370	8495	3.9275123
8426	3.9125621	8461	3.9265521	8496	3.9275174
8427	3.9125673	8462	3.9265673	8497	3.9275224
8428	3.9125724	8463	3.9265824	8498	3.9275275
8429	3.9125776	8464	3.9265975	8499	3.9275325
8430	3.9125827	8465	3.9266127	8500	3.9275375
8431	3.9125879	8466	3.9266278	8501	3.9275426
8432	3.9125930	8467	3.9266429	8502	3.9275476
8433	3.9125982	8468	3.9266580	8503	3.9275527
8434	3.9126033	8469	3.9266732	8504	3.9275577
8435	3.9126085	8470	3.9266883	8505	3.9275627

Num	Logarithm	Num	Logarithm	Num	Logarithm
8506	3.929715	8541	3.931508	8576	3.931[illegible]4
8507	3.929776	8542	3.931559	8577	3.931335
8508	3.929827	8543	3.931610	8578	3.931386
8509	3.929878	8544	3.931661	8579	3.931436
8510	3.929929	8545	3.931712	8580	3.931487
8511	3.929980	8546	3.931762	8581	3.931537
8512	3.930031	8547	3.931813	8582	3.931588
8513	3.930081	8548	3.931864	8583	3.931639
8514	3.930133	8549	3.931915	8584	3.931689
8515	3.930184	8550	3.931966	8585	3.931740
8516	3.930235	8551	3.932016	8586	3.931790
8517	3.930286	8552	3.932067	8587	3.931841
8518	3.930337	8553	3.932118	8588	3.931892
8519	3.930388	8554	3.932169	8589	3.931942
8520	3.930439	8555	3.932220	8590	3.931993
8521	3.930490	8556	3.932270	8591	3.932043
8522	3.930541	8557	3.932321	8592	3.932094
8523	3.930592	8558	3.932372	8593	3.932145
8524	3.930643	8559	3.932423	8594	3.932195
8525	3.930694	8560	3.932473	8595	3.932246
8526	3.930745	8561	3.932524	8596	3.932296
8527	3.930796	8562	3.932575	8597	3.932347
8528	3.930847	8563	3.932625	8598	3.932397
8529	3.930898	8564	3.932676	8599	3.932448
8530	3.930949	8565	3.932727	8600	3.932498
8531	3.930999	8566	3.932778	8601	3.932549
8532	3.931050	8567	3.932828	8602	3.932599
8533	3.931101	8568	3.932879	8603	3.932650
8534	3.931152	8569	3.932929	8604	3.932700
8535	3.931203	8570	3.932980	8605	3.932751
8536	3.931254	8571	3.933031	8606	3.932801
8537	3.931305	8572	3.933082	8607	3.932852
8538	3.931356	8573	3.933132	8608	3.932902
8539	3.931407	8574	3.933183	8609	3.932952
8540	3.931457	8575	3.933234	8610	3.933003

Num	Logarithm	Num	Logarithm	Num	Logarithm
8611	3.935053	8646	3.936818	8681	3.938569
8612	3.935104	8647	3.936865	8682	3.938619
8613	3.935154	8648	3.936915	8683	3.938669
8614	3.935204	8649	3.936965	8684	3.938719
8615	3.935255	8650	3.937016	8685	3.938769
8616	3.935305	8651	3.937066	8686	3.938819
8617	3.935356	8652	3.937116	8687	3.938869
8618	3.935406	8653	3.937166	8688	3.938919
8619	3.935456	8654	3.937216	8689	3.938969
8620	3.935507	8655	3.937267	8690	3.939019
8621	3.935557	8656	3.937317	8691	3.939069
8622	3.935608	8657	3.937367	8692	3.939119
8623	3.935658	8658	3.937417	8693	3.939169
8624	3.935708	8659	3.937467	8694	3.939219
8625	3.935759	8660	3.937517	8695	3.939269
8626	3.935809	8661	3.937568	8696	3.939319
8627	3.935859	8662	3.937618	8697	3.939369
8628	3.935910	8663	3.937668	8698	3.939419
8629	3.935960	8664	3.937718	8699	3.939469
8630	3.936010	8665	3.937768	8700	3.939519
8631	3.936061	8666	3.937818	8701	3.939569
8632	3.936111	8667	3.937868	8702	3.939619
8633	3.936162	8668	3.937918	8703	3.939669
8634	3.936212	8669	3.937969	8704	3.939718
8635	3.936262	8670	3.938019	8705	3.939768
8636	3.936312	8671	3.938069	8706	3.939818
8637	3.936362	8672	3.938119	8707	3.939868
8638	3.936413	8673	3.938169	8708	3.939918
8639	3.936463	8674	3.938219	8709	3.939968
8640	3.936513	8675	3.938269	8710	3.940018
8641	3.936564	8676	3.938319	8711	3.940068
8642	3.936614	8677	3.938369	8712	3.940117
8643	3.936664	8678	3.938419	8713	3.940167
8644	3.936714	8679	3.938469	8714	3.940217
8645	3.936765	8680	3.938519	8715	3.940267

Num	Logarithm	Num	Logarithm	Num	Logarithm
8716	3.940317	8751	3.942057	8786	3.943791
8717	3.940367	8752	3.942107	8787	3.943840
8718	3.940416	8753	3.942156	8788	3.943890
8719	3.940466	8754	3.942206	8789	3.943939
8720	3.940516	8755	3.942256	8790	3.943988
8721	3.940566	8756	3.942305	8791	3.944038
8722	3.940616	8757	3.942355	8792	3.944087
8723	3.940665	8758	3.942404	8793	3.944137
8724	3.940715	8759	3.942454	8794	3.944186
8725	3.940765	8760	3.942504	8795	3.944235
8726	3.940815	8761	3.942553	8796	3.944285
8727	3.940865	8762	3.942603	8797	3.944334
8728	3.940914	8763	3.942652	8798	3.944384
8729	3.940964	8764	3.942752	8799	3.944433
8730	3.941014	8765	3.942701	8800	3.944482
8731	3.941064	8766	3.942801	8801	3.944532
8732	3.941113	8767	3.942851	8802	3.944581
8733	3.941163	8768	3.942900	8803	3.944630
8734	3.941213	8769	3.942950	8804	3.944680
8735	3.941262	8770	3.942999	8805	3.944729
8736	3.641312	8771	3.943049	8806	3.944778
8737	3.941362	8772	3.943098	8807	3.944828
8738	3.941412	8773	3.943148	8808	3.944877
8739	3.941461	8774	3.943197	8809	3.944926
8740	3.941511	8775	3.943247	8810	3.944975
8741	3.941561	8776	3.943296	8811	3.945025
8742	3.941610	8777	3.943346	8812	3.945074
8743	3.941660	8778	3.943395	8813	3.945123
8744	3.941710	8779	3.943445	8814	3.945173
8745	3.541759	8780	3.943494	8815	3.945222
8745	3.941809	8781	3.943544	8816	3.945271
8747	3.941859	8782	3.943593	8817	3.945320
8748	3.941908	8783	3.943642	8818	3.945370
8749	3.941958	8784	3.943692	8819	3.945419
8750	3.942008	8785	3.943741	8820	3.945468

Num	Logarithm	Num	Logarithm	Num	Logarithm
8821	3.945517	8856	3.947237	8891	3.948950
8822	3.945567	8857	3.947286	8892	3.948999
8823	3.945616	8858	3.947335	8893	3.949048
8824	3.945665	8859	3.947384	8894	3.949097
8825	3.945714	8860	3.947433	8895	3.949146
8826	3.945763	8861	3.947482	8896	3.949194
8827	3.945813	8862	3.947531	8897	3.949243
8828	3.945862	8863	3.947580	8898	3.949292
8829	3.945911	8864	3.947629	8899	3.949341
8830	3.945960	8865	3.947678	8900	3.949390
8831	3.946009	8866	3.947727	8901	3.949438
8832	3.946059	8867	3.947776	8902	3.949487
8833	3.946108	8868	3.947825	8903	3.949536
8834	3.946157	8869	3.947874	8904	3.949585
8835	3.946206	8870	3.947923	8905	3.949633
8836	3.946255	8871	3.947972	8906	3.949682
8837	3.946304	8872	3.948021	8907	3.949731
8838	3.946354	8873	3.948070	8908	3.949780
8839	3.946403	8874	3.948119	8909	3.949829
8840	3.946452	8875	3.948168	8910	3.949877
8841	3.946501	8876	3.948217	8911	3.949926
8842	3.946550	8877	3.948266	8912	3.949975
8843	3.946599	8878	3.948315	8913	3.950023
8844	3.946648	8879	3.948364	8914	3.950072
8845	3.946697	8880	3.948413	8915	3.950121
8846	3.946745	8881	3.948461	8916	3.950170
8847	3.946795	8882	3.948510	8917	3.950218
8848	3.946845	8883	3.948559	8918	3.950267
8849	3.946894	8884	3.948608	8919	3.950316
8850	3.946943	8885	3.948657	8920	3.950364
8851	3.946992	8886	3.948706	8921	3.950413
8852	3.947041	8887	3.948755	8922	3.950462
8853	3.947090	8888	3.948804	8923	3.950510
8854	3.947139	8889	3.948852	8924	3.950559
8855	3.947188	8890	3.948901	8925	3.950608

Num	Logarithm	Num	Logarithm	Num	Logarithm
8926	3.950656	8951	3.952356	8996	3.954049
8927	3.950705	8962	3.952404	8997	3.954097
8928	3.950754	8963	3.952453	8998	3.954146
8929	3.950802	8964	3.952501	8999	3.954194
8930	3.950851	8965	3.952550	9000	3.954242
8931	3.950900	8965	3.952598	9001	3.954290
8932	3.950948	7967	3.952647	9002	3.954339
8933	3.950997	8968	3.952695	9003	3.954387
8934	3.951045	8969	3.952744	9004	3.954435
8935	3.951094	8970	3.952792	9005	3.954483
8936	3.951143	8971	3.952840	9006	3.954531
8937	3.951191	8972	3.952889	9007	3.954580
8938	3.951240	8973	3.952937	9008	3.954628
8939	3.951288	8974	3.952985	9009	3.954676
8940	3.951337	8975	3.953034	9010	3.954724
8941	3.951386	8976	.3953082	9011	3.954773
8942	3.951434	8977	3.953131	9012	3.954821
8943	3.951483	8978	3.953179	9013	3.954869
8944	3.951531	8979	3.953228	9014	3.954917
8945	3.951580	8980	3.953276	9015	3.954965
8946	3.951623	8981	3.953324	9016	3.955013
8947	3.951677	8982	3.953373	90 7	3.955062
8948	3.951726	8983	3.953421	9018	3.955110
8949	3.951774	8984	3.953469	9019	3.955158
8950	3.951823	8985	3.953518	9020	3.955206
8951	3.951871	8986	3.953566	9021	3.955254
8952	3.951920	8987	3.953614	9022	3.955302
8953	3.951968	8988	3.953663	9023	3.955351
8954	3.952017	8989	3.953711	9024	3.955399
8955	3.952065	8990	3.953759	9025	3.955447
8956	3.952114	8991	3.953808	9026	3.955495
8957	3.952162	8992	3.953856	9027	3.955543
8958	3.952211	8993	3.953904	9028	3.955591
8959	3.952259	8994	3.953952	9029	3.955639
8960	3.952308	8995	3.954001	9030	3.955687

Num	Logarithm	Num	Logarithm	Num	Logarithm
9031	3.955733	9066	3.957415	9101	3.959089
9032	3.955783	9067	3.957463	9102	3.959136
9033	3.955832	9068	3.957511	9103	3.959184
9034	3.955880	9069	3.957559	9104	3.959232
9035	3.955928	9070	3.957607	9105	3.959279
9036	3.955976	9071	3.957655	9106	3.959327
9037	3.956024	9072	3.957703	9107	3.959375
9038	3.956072	9073	3.957750	9108	3.959423
9039	3.956120	9074	3.957798	9109	3.959470
9040	3.956168	9075	3.957845	9110	3.959518
9041	3.956216	9076	3.957894	9111	3.959566
9042	3.956264	9077	3.957942	9112	3.959613
9043	3.956312	9078	3.957990	9113	3.959669
9044	3.956360	9079	3.958038	9114	3.959701
9045	3.956468	9080	3.958085	9114	3.959756
9046	3.956456	9081	3958133	9116	3.959804
9047	3.956504	9082	3.958181	9117	3.959852
9048	3.956552	9083	3.958229	9118	3.959889
9049	3.956600	9084	3.958277	9119	3.959947
9050	3.956648	9085	3.958324	9120	3.959994
9051	3.956696	9086	3.958372	9121	3.960042
9052	3.956744	9087	3.958420	9122	3.960090
9053	3.956792	9088	3.958468	9123	3.960137
9054	3.956840	9089	3.958516	9124	3.960185
9055	3.956888	9090	3.958563	9125	3.960232
9056	3.956936	9091	3.958611	9126	3.960280
9057	3.956984	9092	3.958659	9127	3.960328
9058	3.957032	9093	3.958707	9128	3.960375
9059	3.957080	9094	3.958754	9129	3.960423
9060	3.957128	9095	3.958802	9130	3.960470
9061	3.957176	9096	3.958850	9131	3.960518
9062	3.957224	9097	3.958898	9132	3.960561
9063	3.957272	9098	3.958945	9133	3.960613
9064	3.957319	9099	3.958993	9134	3.960661
9065	3.957367	9100	3.959041	9135	3.960708

Num	Logarithm	Num	Logarithm	Num	Logarithm
9136	3.960756	9171	3.962416	9206	3.964071
9137	3.960803	9172	3.962464	9207	3.964118
9138	3.960851	9173	3.962511	9208	3.964165
9139	3.960898	9174	3.962558	9209	3.964212
9140	3.960946	9175	3.962606	9210	3.964259
9141	3.960993	9176	3.962653	9211	3.964306
9142	3.961041	9177	3.962700	9212	3.964353
9143	3.961088	9178	3.962748	9213	3.964401
9144	3.961136	9179	3.962795	9214	3.964448
9145	3.961183	9180	3.962842	9215	3.964495
9146	3.961231	9181	3.962890	9216	3.964542
9147	3.961278	9182	3.962937	9217	3.964589
9148	3.961326	9183	3.962984	9218	3.964636
9149	3.961373	9184	3.963031	9219	3.964683
9150	3.961421	9185	3.963079	9220	3.964730
9151	3.961468	9186	3.963126	9221	3.964778
9152	3.961516	9187	3.963173	9222	3.964825
9153	3.961563	9188	3.963221	9223	3.964872
9154	3.961610	9189	3.963268	9224	3.964919
9155	3.961658	9190	3.963315	9225	3.964966
9156	3.961705	9191	3.963362	9226	3.965013
9157	3.961753	9192	3.963410	9227	3.965060
9158	3.961800	9193	3.963457	9228	3.965107
9159	3.961848	9194	3.963504	9229	3.965154
9160	3.961895	9195	3.963551	9230	3.965201
9161	3.961942	9196	3.963599	9231	3.965248
9162	3.961990	9197	3.963646	9232	3.965295
9163	3.962037	9198	3.963693	9233	3.965342
9164	3.962085	9199	3.963740	9234	3.965389
9165	3.962132	9200	3.963787	9235	3.965436
9166	3.962179	9201	3.963835	9236	3.965483
9167	3.962227	9202	3.963882	9237	3.965530
9168	3.962274	9203	3.963929	9238	3.965578
9169	3.962322	9204	3.963976	9239	3.965625
9170	3.962369	9205	3.964023	9240	3.965672

Num	Logarithm	Num	Logarithm	Num	Logarithm
9241	3.965719	9276	3.967360	9311	3.958995
9242	3.965766	9277	3.967407	9312	3.959043
9243	3.965813	9278	3.967454	9313	3.959089
9244	3.965859	9279	3.967501	9314	3.959136
9245	3.965906	9280	3.967548	9315	3.959182
9246	3.965953	9281	3.967584	9316	3.969229
9247	3.966000	9282	3.967641	9317	3.969276
9248	3.966047	9283	3.967688	9318	3.959322
9249	3.966094	9284	3.967735	9319	3.969369
9250	3.966141	9285	3.967781	9320	3.969415
9251	3.966188	9286	3.967828	9321	3.969462
9252	3.966235	9287	3.967875	9322	3.969509
9253	3.966282	9288	3.967922	9323	3.969555
9254	3.956329	9289	3.967969	9324	3.969602
9255	3.966376	9290	3.968015	9325	3.969648
9250	3.956423	9291	3.968062	9326	3.969695
9257	3.965470	9292	3.968109	9327	3.969742
9258	3.966517	9293	3.968155	9328	3.969788
9259	3.966564	9294	3.968202	9329	3.969835
9260	3.956611	9295	3.968249	9330	3.969881
9261	3.966657	9296	3.968295	9331	3.969928
9262	3.966704	9297	3.968342	9332	3.969974
9263	3.956751	9298	3.968389	9333	3.970021
9264	3.966798	9299	3.968436	9334	3.970067
9265	3.966845	9300	3.968482	9335	3.970114
9266	3.900892	9301	3.968529	9336	3.970160
9267	3.956939	9302	3.968576	9337	3.970207
9268	3.966986	9303	3.968623	9338	3.970253
9269	3.967032	9304	3.968669	9339	3.970300
9270	3.957079	9305	3.968716	9340	3.970346
9271	3.957126	9306	3.968763	9341	3.970393
9272	3.957173	9307	3.968809	9342	3.970439
9273	3.957220	9308	3.968856	9343	3.970485
9274	3.967267	9309	3.968903	9344	3.970532
9275	3.967313	9310	3.968949	9345	3.970579

Num	Logarithm	Num	Logarithm	Num	Logarithm
9346	3.970625	9381	3.972249	9416	3.973866
9347	3.970672	9382	3.972295	9417	3.973912
9348	3.970718	9383	3.972341	9418	3.973958
9349	3.970765	9384	3.972388	9419	3.974004
9350	3.970811	9385	3.972434	9420	3.974050
9351	3.970858	9386	3.972480	9421	3.974097
9352	3.970904	9387	3.972526	9422	3.974143
9353	3.970950	9388	3.972573	9423	3.974189
9354	3.970997	9389	3.972619	9424	3.974235
9355	3.971043	9390	3.972665	9425	3.974281
9356	3.971090	9391	3.972711	9426	3.974327
9357	3.971136	9392	3.972758	9427	3.974373
9358	3.971183	9393	3.972804	9428	3.974419
9359	3.971229	9394	3.972850	9429	3.974465
9360	3.971275	9395	3.972896	9430	3.974511
9361	3.971322	9396	3.972943	9431	3.974557
9362	3.971368	9397	3.972989	9432	3.974603
9363	3.971415	9398	3.973035	9433	3.974649
9364	3.971461	9399	3.973081	9434	3.974695
9365	3.971507	9400	3.973127	9435	3.974741
9366	3.971554	9401	3.973174	9436	3.974787
9367	3.971600	9402	3.973220	9437	3.974834
9368	3.971646	9403	3.973266	9438	3.974880
9369	3.971693	9404	3.973312	9439	3.974926
9370	3.971739	9405	3.973358	9440	3.974972
9371	3.971785	9406	3.973405	9441	3.975018
9372	3.971832	9407	3.973451	9442	3.975064
9373	3.971878	9408	3.973497	9443	3.975110
9374	3.971924	9409	3.973543	9444	3.975156
9375	3.971971	9410	3.973589	9445	3.975202
9376	3.972017	9411	3.973635	9446	3.975247
9377	3.972063	9412	3.973681	9447	3.975293
9378	3.972110	9413	3.973728	9448	3.975339
9379	3.972156	9414	3.973774	9449	3.975385
9380	3.972202	9415	3.973820	9450	3.975431

Num	Logarithm	Num	Logarithm	Num	Logarithm
9451	3.975477	9486	3.977083	9521	3.978682
9452	3.975523	9487	3.977128	9522	3.978728
9453	3.975569	9488	3.977174	9523	3.978773
9454	3.975615	9489	3.977220	9524	3.978819
9455	3.975661	9490	3.977266	9525	3.978865
9456	3.975707	9491	3.977312	9526	3.978910
9457	3.975753	9492	3.977357	9527	3.978956
9458	3.975799	9493	3.977403	9528	3.979001
9459	3.975845	9494	3.977449	9529	3.979047
9460	3.975891	9495	3.977495	9530	3.979092
9461	3.975937	9496	3.977540	9531	3.979138
9462	3.975982	9497	3.977586	9532	3.979184
9463	3.976028	9498	3.977632	9533	3.979229
9464	3.976074	9499	3.977677	9534	3.979275
9465	3.976120	9500	3.977723	9535	3.979320
9466	3.976166	9501	3.977769	9536	3.979366
9467	3.976212	9502	3.977815	9537	3.979411
9468	3.976258	9503	3.977860	9538	3.979457
9469	3.976304	9504	3.977906	9539	3.979502
9470	3.976350	9505	3.977952	9540	3.979548
9471	3.976395	9506	3.977997	9541	3.979593
9472	3.976441	9507	3.978043	9542	3.979639
9473	3.976487	9508	3.978089	9543	3.979684
9474	3.976533	9509	3.978134	9544	3.979730
9475	3.976579	9510	3.978180	9545	3.979775
9476	3.976625	9511	3.978226	9546	3.979821
9477	3.976670	9512	3.978271	9547	3.979866
9478	3.976716	9513	3.978317	9548	3.979912
9479	3.976762	9514	3.978363	9549	3.979957
9480	3.976808	9515	3.978408	9550	3.980003
9481	3.976854	9516	3.978454	9551	3.980048
9482	3.976899	9517	3.978500	9552	3.980094
9483	3.976945	9518	3.978545	9553	3.980139
9484	3.976991	9519	3.978591	9554	3.980185
9485	3.977037	9520	3.978636	9555	3.980230

Num	Logarithm	Num	Logarithm	Num	Logarithm
9556	3.980276	9591	3.981863	9626	3.983445
9557	3.980321	9592	3.981909	9627	3.983491
9558	3.980367	9593	3.981954	9628	3.983536
9559	3.980412	9594	3.981999	9629	3.983581
9560	3.980458	9595	3.982045	9630	3.983626
9561	3.980503	9596	3.982090	9631	3.983671
9562	3.980548	9597	3.982135	9632	3.983716
9563	3.980594	9598	3.982180	9633	3.983761
9564	3.980639	9599	3.982226	9634	3.983806
9565	3.980685	9600	3.982271	9635	3.983851
9566	3.980730	9601	3.982316	9636	3.983896
9567	3.980775	9602	3.982361	9637	3.983941
9568	3.980821	9603	3.982406	9638	3.983986
9569	3.980866	9604	3.982452	9639	3.984032
9570	3.980911	9605	3.982497	9640	3.984077
9571	3.980957	9606	3.982542	9641	3.984122
9572	3.981002	9607	3.982587	9642	3.984167
9573	3.981048	9608	3.982633	9643	3.984212
9574	3.981093	9609	3.982678	9644	3.984257
9575	3.981138	9610	3.982723	9645	3.984302
9576	3.981184	9611	3.982768	9646	3.984347
9577	3.981229	9612	3.982813	9647	3.984392
9578	3.981274	9613	3.982858	9648	3.984437
9579	3.981320	9614	3.982904	9649	3.984482
9580	3.981365	9615	3.982949	9650	3.984527
9581	3.981410	9516	3.982994	9651	3.984572
9582	3.981456	9617	3.983039	9652	3.984617
9583	3.981501	9618	3.983084	9653	3.984662
9584	3.981546	9619	3.983129	9654	3.984707
9585	3.981592	9620	3.983175	9655	3.984752
9586	3.981637	9621	3.983220	9656	3.984797
9587	3.981682	9522	3.983265	9657	3.984842
9588	3.981728	9623	3.983310	9658	3.984887
9589	3.981773	9624	3.983355	9659	3.984932
9590	3.981818	9625	3.983400	9660	3.984977

Num	Logaritbm	Num	Logaritbm	Num	Logaritbm
9661	3.985023	9696	3.986592	9731	3.988157
9662	3.985067	9697	3.986637	9732	3.988202
9663	3.985113	9698	3.986682	9733	3.988246
9664	3.985156	9699	3.986727	9734	3.988291
9665	3.985201	9700	3.986771	9735	3.988336
9666	3.985246	9701	3.986816	9736	3.988380
9667	3.985291	9702	3.986861	9737	3.988425
9668	3.985336	9703	3.986906	9738	3.988469
9669	3.985381	9704	3.986950	9739	3.988514
9670	3.985426	9705	3.986995	9740	3.988559
9671	3.985471	9706	3.987040	9741	3.988603
9572	3.985516	9707	3.987085	9742	3.988648
9573	3.985561	9708	3.987129	9743	3.988692
9574	3.985606	9709	3.987174	9744	3.988737
9675	3.985651	9710	3.987219	9745	3.988781
9576	3.985695	9711	3.987264	9746	3.988826
9677	3.985740	9712	3.987308	9747	3.988871
9678	3.985785	9713	3.987353	9748	3.988915
9679	3.985830	9714	3.987398	9749	3.988960
9580	3.985875	9715	3.987442	9750	3.989004
9681	3.985920	9716	3.987487	9751	3.989049
9682	3.985965	9717	3.987532	9752	3.989093
9683	3.986009	9718	3.987576	9753	3.989138
9684	3.986054	9719	3.987621	9754	3.989182
9585	3.986099	9720	3.987666	9755	3.989227
9686	3.986145	9721	3.987710	9756	3.989271
9687	3.986189	9722	3.987755	9757	3.989316
9688	3.986234	9723	3.987802	9758	3.989360
9689	3.986279	9724	3.987844	9759	3.989405
9590	3.986323	9725	3.987889	9760	3.989449
9691	3.986368	9726	3.987934	9761	3.989494
9692	3.986413	9727	3.987978	9762	3.989538
9593	3.986458	9728	3.988023	9763	3.989583
9694	3.986503	9729	3.988068	9764	3.989627
9595	3.986547	9730	3.988112	9765	3.989672

Num	Logaritbm	Num	Logaritbm	Num	Logaritbm
9766	3.989716	9801	3.991270	9836	3.992818
9767	3.989761	9802	3.991314	9837	3.992862
9768	3.989805	9803	3.991359	9838	3.992906
9769	3.989850	9804	3.991403	9839	3.992951
9770	3.989894	9805	3.991447	9840	3.992995
9771	3.989939	9806	3.991491	9841	3.993039
9772	3.989983	9807	3.991536	9842	3.993083
9773	3.990027	9808	3.991580	9843	3.993127
9774	3.990072	9809	3.991624	9844	3.993171
9775	3.990116	9810	3.991669	9845	3.993215
9776	3.990161	9811	3.991713	9846	3.993259
9777	3.990205	9812	3.991757	9847	3.993303
9778	3.990250	9813	3.991801	9848	3.993348
9779	3.990294	9814	3.991846	9849	3.993392
9780	3.990338	9815	3.991890	9850	3.993436
9781	3.990383	9816	3.991934	9851	3.993480
9782	3.990427	9817	3.991978	9852	3.993524
9783	3.990472	9818	3.992023	9853	3.993568
9784	3.990516	9819	3.992067	9854	3.993612
9785	3.990560	9820	3.992111	9855	3.993656
9786	3.990605	9821	3.992155	9856	3.993700
9787	3.990649	9822	3.992199	9857	3.993744
9788	3.990694	9823	3.992244	9858	3.993788
9789	3.990738	9824	3.992288	9859	3.993832
9790	3.990782	9825	3.992332	9860	3.993876
9791	3.990827	9826	3.992376	9861	3.993921
9792	3.990871	9827	3.992421	9862	3.993965
9793	3.990915	9828	3.992465	9863	3.994009
9794	3.990960	9829	3.992509	9864	3.994053
9795	3.991004	9830	3.992553	9865	3.994097
9796	3.991048	9831	3.992597	9866	3.994141
9797	3.991093	9832	3.992641	9867	3.994185
9798	3.991137	9833	3.992686	9868	3.994229
9799	3.991181	9834	3.992730	9869	3.994273
9800	3.991226	9835	3.992774	9870	3.994317

Num	Logarithm	Num	Logarithm	Num	Logarithm
9871	3.994361	9906	3.995898	9941	3.997430
9872	3.994405	9907	3.995942	9942	3.997473
9873	3.994449	9908	3.995989	9943	3.997517
9874	3.994493	9909	3.996026	9944	3.997561
9875	3.994537	9910	3.996073	9945	3.997604
9876	3.994581	9911	3.996117	9946	3.997648
9877	3.994625	9912	3.996161	9947	3.997692
9878	3.994669	9913	3.996205	9948	3.997735
9879	3.994713	9914	3.996248	9949	3.997779
9880	3.994756	9915	3.996292	9950	3.997823
9881	3.994800	9916	3.996336	9951	3.997866
9882	3.994844	9917	3.996380	9952	3.997910
9883	3.994888	9918	3.996424	9953	3.997954
9884	3.994932	9919	3.996457	9954	3.997997
9885	3.994976	9920	3.996511	9955	3.998041
9886	3.995020	9921	3.996555	9956	3.998084
9887	3.995064	9922	3.996599	9957	3.998128
9888	3.995108	9923	3.996643	9958	3.998172
9889	3.995152	9924	3.996686	9959	3.998215
9890	3.995196	9925	3.996730	9960	3.998259
9891	3.995240	9926	3.996774	9961	3.998302
9892	3.995284	9927	3.996818	9962	3.998346
9893	3.995328	9928	3.996861	9963	3.998390
9894	3.995371	9929	3.996905	9964	3.998433
9895	3.995415	9930	3.996949	9965	3.998477
9896	3.995459	9931	3.996993	9966	3.998520
9897	3.995503	9932	3.997036	9967	3.998564
9898	3.995547	9933	3.997084	9968	3.998608
9899	3.995591	9934	3.997122	9969	3.998651
9900	3.995635	9935	2.997167	9970	3.998695
9901	3.995679	9936	3.997211	9971	3.998738
9902	3.995722	9937	3.997255	9972	3.998782
9903	3.995766	9938	3.997299	9973	3.998825
9904	3.995810	9939	3.997342	9974	3.998859
9905	3.995854	9940	3.997386	9975	3.998912

THE DESCRIPTION and USE Of the *Logarithmical* TABLE Of PROPORTION.

The *TABLE* described.

THE *Table* contains the first Ten *Chiliads* of the *Logarithms*, of all *Absolute Numbers* from One to Ten Thousand. In each Page of the Table is contained Six Rows or Columns. In the Fifft, the Third, and the Fifth (towards the Left Hand) are contained all *Absolute Numbers*, beginning at 1, and so on by 2, 3, 4, 5, 6, &c. to 10000, (having the word *Num.* at the head of each Column) which is the last Number in the Table.

Then, in the Second, Fourth and Sixth Row, or Columns of every Page, are contained the *Proportional* or *Logarithmical Numbers*, answering to each *absolute Number*, against which it standeth; and these Columns have at the head of them the word *Logar.*

The Numbers being thus disposed in the several Pages of the Table, it is easie to find what *Proportional* or *Logarithmical Number* answers to any *absolute Number* that shall be required. Or, on the contrary, if any *Proportional* or *Logarithmical Number* be given, it will be easie to find the *absolute Number* to which it belongeth.

For, If you find your *absolute Number* in any Column of the Table, (under the Title [*Num.*] That Number that standeth in the next Column to it, on the Right Hand, under the Title [*Logar.*] is the *Proportional* or *Logarithmical Number* thereunto belonging.

And on the contrary, In what part of the Table soever you find any *Proportional* or *Logarithmical Number*, that Number which standeth in the next Column on the Left Hand thereof, is the *absolute Number* belonging to that *Logarithmical Number* so found.

And note further, That all the *Logarithmical Numbers* between 1 and 10, have a Cypher before them, thus, 0; All Numbers between 10 and 100, have the Figure 1 before them, thus, 1; All Numbers between 100, and 1000, have the Figure

Figure 2 before them, thus 2; And all Numbers between 1000 and 10000, have the Figure of 3 before them, thus 3.

And, that what I have here delivered may be made plain, I shall give Examples thereof in the two following Propositions.

PROP. I.

Any Absolute Number *being given, how to find the* Logarithmical *or* Proportional Number *thereunto belonging.*

LEt it be required to find the *Proportional* or *Logarithmical Number* belonging to 17. Turn to the Table, and in the First Column of the first Page thereof, you shall find 17 under the word [*Num.*] and right against it, towards the Right Hand you shall find this Number, 1,230449, which is the *Logarithm* thereof. In like manner, in the same Page you shall find 45 under [*Num.*] against it, if you find 1,653212, which is the *Logarithm* thereof. Again, in the second Page of the Table, if you look for the Number 136, under the [*Num.*] against it you shall find 2,133539, which is the *Logarithm* thereof. And this course you are to observe through the whole

Table, and ſo ſhall you find, that

The *Logarithm* of	6	will be 0,778151
	48	1,681241
	436	2,639486
	6782	3,831358

And by the Converſe of what is here delivered, you may find the *Abſolute Number* anſwering to any given *Logarithm*, as in the following.

PROP. II.

A Logarithmical *or* Proportional Number *being given, to find the* Abſolute Number *thereunto belonging.*

LEt it be required to find the *Abſolute Number* belonging to this *Logarithm* 1,230449. Look in the Table, and in the firſt Page thereof, and caſting your Eye down among the Numbers under the word [*Logar.*] you ſhall find this Number to ſtand juſt againſt 17; or you ſhall find 17 to ſtand on the left hand of it; wherefore 17 is the *abſolute Number* belonging to this *Logarithm*. In like manner, If the *abſolute Number* belonging to this *Logarithm* 1,6532152, were required; ſeek for this Number under the word [*Logar.*] and on the left Hand of it you ſhall find

45,

45, which is the *absolute Number* thereunto belonging. Again, 136 will be found to be the *absolute Number* belonging to this *Logarithme* 2,133539. And by the same Method you may find, that

The *absolute Number* answering to	0,778151	will be found to be	6
	1,681241		48
	2,639486		436
	3,831358		6782

And so of all other Numbers comprised in this Table, which are all Numbers under 10000.

Caution.

But when you have a *Logarithmical Number* given, (which when you look for) you cannot find it in the *Table*, you must then take the neareſt Number thereunto, and the *absolute Number* which ſtands againſt it, is the neareſt whole Number, which you muſt take; For, to inſtance in *Fractions*, I ſhall at this time forbear to ſhew, we having no uſe thereof in this following Treatiſe. But thus for the

Abſolute Number anſwering to this *Logarithm.*	0,632587	you muſt take	4
	1,382114		24
	2,690003		486
	3,886201		7605

And ſo of all others. And let this ſuffice, for the Deſcription, now follows,

THE USE of the TABLE.

I. *In* ARITHMETICK.

TO pass by *Addition* and *Substraction* of whole Numbers, as being a thing common to all Men; I shall proceed to *Multiplication*, *Division*, the Extracting of the *Square* and *Cube Roots*, and working of the *Rule* of *Proportion*, as being such parts of *Arithmetick*, which tend wholly to the matter intended in this Book. And therefore I shall begin with

MULTIPLICATION By the Tables.

To perform *Multiplication* by the Table, you must adde *Logarithms* of the two Numbers to be Multiplyed together, and the Sum of them will be the *Logarithm* of the Number produced by that *Multiplication*.

Example.

Example. 1.

Let it be required to *Multiply* 43 by 25.

First, Set down the two Numbers to be Multiplyed one under the other, as 43 and 25, and by the side of them set their respective *Logarithms*, so the *Log.* of 43 is 1,633468, the *Logarithm* of 25 is 1,397240, which being added together, the Sum of them is 3,031408, which *Logarithm* being found in the Table, the *absolute Number* answering thereunto, is 1075, and so much is the Product of 43, being Multiplyed by 25.

43 — *Log.*	1,633468
25 — *Log.*	1,397240
1075 *Log.*	3,031408

Example. 2.

Let it be required to Multiply 163 by 48.

Set the Numbers down, as in the Margin, to find the *Log.* of 163, which is 2.212187, and set it down by it; Also look the *Logar.* of 48, which is 1.681241, these two added together, produce 3.893428, the *absolute Number* belonging to this *Logarith.* will be found to be 7824, and so much is the Product of 163 Multiplyed by 48.

163 — *Logar.*	2.212187
49 — *Logar.*	1.681241
7824 — *Logar.*	3,893428

Example. 3.

Let it be required to Multiply 202 by 31.

The Numbers being set down, and the respective *Logarithmes* by them, and added together, the Sum of them is 3,796712, the Number answering thereunto, is 6262; and so much is the Product of 202 being Multiplyed by 31.	202	*Logar.*	2,305351
	31	*Logar.*	1,491361
	6262	*Logar.*	3,796712

DIVISION
By the Tables.

As *Multiplication* by the Tables was performed by *Addition*, so *Division* by the Table is performed by *Substraction*. Wherefore to perform *Division*, you must *Substract* the *Logarithm* of the Number by which you are to Divide from the *Logarithm* of the Number which is to be Divided; and the Number which Remains, shall be the *Logarithm* of the Quotient.

Example 1.

Example 1.

Let it be required to Divide 1075, by 43.

First, Set down 3,031408 the *Log.* of 1075, (the Number to be Divided) and under it set 1,633468, the *Logarithm* of 43, the Number by which you are to Divide.

1075 — *Log.* -	3,031408	
43 -- *Log.* -	1,633468	
25 -- *Log.* -	1,397940	

Secondly, *Substract* the lesser from the greater, and the Remainer will be 1,397940. Which *Logarithm* being found in the Table, the *absolute Number* answering thereunto, is 25, which is the Quotient, and so many times is 43 contained in 1075.

Example 2.

Let it be required to Divide 7824 by 48.

Set the Numbers and the *Logarithms* proper to them, down as in the Margin, then Substract the *Logar.* of 48, from the *Log.* of 7824, and there will remain 2,212187, the *Logarithm* of 163, and that is the Quotient of that Division; and so many times is 48 contained in 7824.

7824 - *Log.* -	3,893428	
48 - *Log.* -	1,681241	
163 - *Log.* -	2,212187	

Example 3.

Example. 3.

Let it be required to *Divide* 6262 by 202.

6262 — *Logar.* 3.796712
202 — *Logar.* 2.305351

31 — *Logar.* 1.491361

Set the Numbers and their reſpective *Logarith.* by them as in the Margin; then Subſtract the *Logar.* of the leſſer Number, from the *Logar.* of the greater Number, and the Remainer will be 1.491361, the abſolute Numbring whereunto is 31, and ſo much will the *Quotient* of 6262 being Divided by 202 be, as in the Margin it is plain.

To

To Extract the *SQUARE & CUBE-ROOTS* By the TABLES.

I. *Of the* SQUARE-ROOT.

THe *Square Root* is *Extracted* by taking half of the *Logarithm* of the *Given Number* whose *Root* is required, for the *Logarithm* Remaining ſhall be the *Logarithm* of the *Root* ſought

Example. 1.

Let it be required to find the *Square Root* of 4356.

Set down the *Logarithm* thereof, which is 3.639088, and take the half thereof, which is 1.89544, the Abſolute Number anſwering to this *Logarithm* is 66, and that is the *Square Root* of 4356.

4356. *Log.*	3.639088
the half.	1.819544

Example.

Example. 2.

Let the *Square Root* of 9409 be required.

Set down the *Log.* thereof, which is 3,973543, and take the half thereof, which is 1,986771. The *abſolute Number* anſwering to this Logarithm is 97, and that is the *Square Root* of 9409.

9409 — *Log.* — 3,973543
the half. — 1,986771

Example 3.

If 66 be a *Root* given, what is the *Square* thereof?

Set down the *Logarithm* of the *Root* given, 66, which is 1,819544, and double the ſame, the Sum is 3,639088, the *abſolute Number* anſwering thereto, is 4356, and that is the *Square Number*, of which 66 is the *Root*.

66 — *Logar.* — 1,819544 — *Root.*
4356 — *Logar.* — 3,639088 — *Square.*

II. Of the CUBE ROOT.

AS the *Square Root* was obtained by *Partition*, or Dividing by 2. The *Cube Root* muſt be obtained by *Tripartition*, or Dividing by 3.

Example. 1.

Let it be required to Extract the *Cube Root* of 4913.

Firſt, Find the Logarithm of 4913, which is 3,691346, and take a third part thereof, which is 1,230449, the *abſolute Number* anſwering to this Logarithm, is the *Cube Root* of 4913, and will be found to be 17. As followeth in the *Example.*

4913 — *Logar.* — 3,691346 — *Cube.*
17 — *Logar.* — 1230449 — *Root.*

Example 2.

What is the *Cube Root* of 729?

The Logarithm of 729 is 2,862727, one third part whereof is 0,954242, and the *abſolute Number* anſwering thereunto is 9. So is 9 to the *Cube Root* of 729, as followeth.

729 — *Logar.* — 2,862727 — *Cube.*
9 — *Logar.* — 0,954242 — *Root.*

Example 3.

Example. 3.

Let 17 be a *Cubick Number* given, whose *Root* is required.

Firſt, Set down the *Logarithm* of the *Root* given, namely 17, and *Multiply* it by 3, the Product will be 3.691347, whose Abſolute Number is 4913, which is the *Cube* of 17, as in the *Example.*

17 — *Log.* 1.230449 *Root*
4913 — *Log.* 3.691347 *Cube*

To work the *RULE* of *PROPORTION*, Commonly called The *GOLDEN-RULE*, By the TABLE.

THe *Rule* of *Proportion*, is to find a fourth Number to any three proportional Numbers given; And to work any Queſtion in this Rule direct, you muſt, *Set down the* Logarithms *of the three* Proportional Numbers *in order one under another, then add the ſecond and third* Logarithms *together, and from their Sum* Subſtract *the firſt* Logarithm, *and the remainer ſhall be the* Logarithm *of that Number which anſwers the* Queſtion.

Example 1.

If 45 Ells of Cloth coſt 30 *l.* what ſhall 84 Ells of the ſame coſt?

Firſt, Set down the Logarithm of 45, and under it the Logarithm of 30, and under that the Logar. of 84, in the ſame manner as here is done,

If 45 Ells — 45 *Log.* — 1,653212

Cost 30 Pound — 30 *Log.* — 1,477121
What 84 Ells — 84 *Log.* — 1,924279

Sum of the second and third — 3,401400
First Number being substracted, leaves — 1,748188

Secondly, Add the second and third Logarithms together, and their Sum is 3,401400, from which Substract the first Logar. *viz.* 1,653212, and the Remainer will be 1748188, which is the Logarithm of 56, and so many *l.* will 84 Ells cost.

Example 2.

If One Pound of any Commodity cost 1 l. 2 d. 3 q. or 3 farthings, what shall 112 l. or C. Grosse of that Commodity cost?

If 1 *l.* — *Log.* — 0,000000

Cost 63 *far. Log.* — 63 — 1,799340
What 112 *l. Log.* — 112 — 2,049218

Sum of the second & third — 3,848558

Set down the Numbers as above, then Add the second and third Logarithms together, their Sum is 3848558, from which the first Logarithm

should

ſhould be Subſtracted, but ſeeing that is 0.000000 the Logarithm ſtill remains as it is, and is the Logarithm of 7051; and ſo many Farthings will 112 *l.* coſt.

Now to know how many Shillings is contained in this 7051 Farthings. You muſt Subſtract the Logarithm of 48 (which is the number of Farthings in one Shilling,)

Which is ——————— 1.681241
From the Logar. of 7051 — 3.848558

The Remainer will be —— 2.167317

Which is the Logarithm of 147, and ſo many Shillings will 112 *l.* coſt.

In the working of the *Rule of Three* by theſe Tables, you are to obſerve, that if the Third Number be greater than the Firſt, the Fourth Number will be leſs than the Second; you muſt add the Logarithms of the Firſt and ſecond Numbers together, and from the Sum of them Subſtract the Logarithm of the Third, and the Remainer ſhall be the Logarithm of the Number which anſwers the Queſtion, as in the Examples following.

Example. 3.

If 60 Bricklayers *can make a Wall containing any Number of* Rods *in* 45 *days, how many days will* 40 Bricklayers *be a building of the like Wall?*

First, Set down the Numbers orderly as you ſee done in the Example following. Then add the Logarithm of 60, and the Logarithm of 45 together, their Sum will be 3.431363, from which Subſtract the Logarithm of 40, and there will remain 1.329303, the neareſt Logarithm to which being found in the Table, is 1.8260748, whoſe Abſolute Number is 67; and ſo many days will 40 *Bricklayers* be about the ſame Wall: And on the contrary, if the Third Number be leſs than the Firſt, the Fourth Number will be greater than the Second; and in ſuch caſes

By the *Example* it is plain,

If 60 *Bricklayers* — *Log.* 60 — 1.778151
reguire 45 days — *Log.* 43 — 1.653212

What 40 *Bricklayers* - *Log.* - 40 - 1.602060

The Sum of the Firſt and Second -- 3.431363
The Third *Logar.* Subſtracted — 1.829303

The neareſt Abſolute Number anſwering to this Logarithm is 67, and ſo many days will 40 *Bricklayers* be about the ſame piece of work that 60 would have done in 45 days.

Example 4.

If a Cloſe will Graize 210 *Horſes* 6 *days, how many Horſes will the ſame Cloſe Graize for* 7 *days?*

Set

Set the Numbers down as followeth.

If 6 days — *Log.* —— 0.778151
210 Horſes - *Log.* 210 - 2.322219

What 7 days - 7 *Log.* - 0.845098

Sum of the Firſt and Second — 3.100370
The Third *Log.* being Subſtracted, leaves —— 2.255272

Which is the Logarithm of 180, and ſo many Horſes will the ſame Cloſe Graize for 7 days.

THE MENSURATION OF *Plain Geometrical Figures* By the TABLE.

I. *To Measure a* Geometrical Square

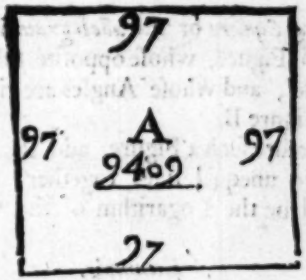
A *Geometrical Square* is such a Figure whose 4 sides are all equal, and whose 4 Angles are all right Angles, as is the Figure A.

To Measure such a Square, set down the Logarithm of the side of the Square twice, and adde them together, the Sum shall be the Logarithm of the Area or Content.

Example:

Example.

Let the side of the Square A be 97, what is the Area thereof?



Set down the Logarithm of 97 twice, and add them together, the Sum of them is 3.973542, which is the Logarithm 9409, and that is the Area or Content of that *Geometrical Square* whose side is 97. As by the Work appears.

97 — *Log.* — 1.986771
97 — *Log.* — 1.986771

9409 — *Log.* — 3.973542

Thus if the side of this Square had been 97 { Inches / Feet / Yards / Pole or Rods } The Content would have been 9409. { Inches / Feet / Yards / Rods &c.

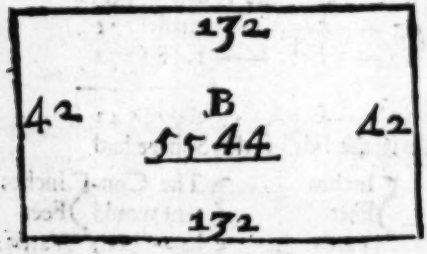
II. *To Measure the* Long-Square, *Or* Parallelogram.

A *Long-Square* or *Parallelogram* is a Geometrical Figure, whose oppolite sides are equal and Parallel, and whose Angles are right Angles, as is the Figure B.

To Measure such a Figure, add the Logarithms of the two unequal sides together, the Sum of them shall be the Logarithm of the Content or Area.

Example.

Let the Length of the *Long-Square* or *Parallelograms* be 132, and the Breadth thereof 42 what is the Content?



Add:

Add the Logarithm of 42, to the Logarithm of 132, the Sum of them is 3.743823, which is the Logarithm of 5544, and that is the Area of the *Parallelogram.*

See the Work,

Length —	132 —	*Log.* —	2.120574
Breadth —	42 —	*Log.* —	1.623249
Content —	5544 —	*Log.* —	3.743823

Thus, if the *Long-Square* B were a piece of Land, and ſhould contain 132 Perches in Length, and 42 Perches in Breadth, the Content would be found to be 5544 Perches — Now to know how many Acres this Piece is,

Subſtract the Logarithm of 160 (becauſe there are 160 Perches in one Acre) out of the Logarithm of 5544, and there ſhall remain the Logarithm of the Content in Acres.

Thus,

5544 —	*Log.* —	3.743823
160 —	*Log.* —	2.204120
Acres 35 *fere*, -	*Log.* —	1.539703

III. *To Measure any* Triangle.

A *Triangle* is a Geometrical figure consisting of three Sides, and as many Angles, as is the Figure C. In which Triangle, and in all others (in this case) the longest side thereof is called the Base of the Triangle, and a right Line drawn from the Angle, opposite to the Base, is called the Cathetus or Perpendicular.

To Measure all sorts of Triangles *There are Four ways, but principally Two,* viz.

1. The Logarithm of half the Base, being added to the Logarithm of the Perpendicular, giveth the Logarithm of the Area or Content.

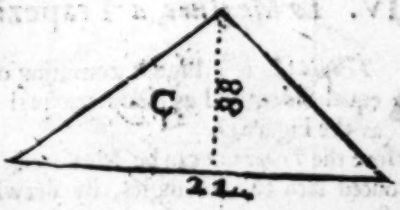
Or,

2. The Logarithm of half the Perpendicular, added to the Logarithm of the whole Base, giveth the Logarithm of the Area or Content.

Example.

Example.

In the Triangle C, Let the Base be 214, and the Perpendicular 88, and let the Area of the Triangle be required.



1. To the Logarithm of half the Base 107, add the Logarithm of the Perpendicular 88, the Sum of them is 3.973866, which is the Logarithm of 9416, and that is the Area or Content of the Triangle.

Half the Base — 107 — *Log.* — 2.029384
Perpendicular — 88 — *Log.* — 1.944482

Area — 9416 — *Log.* — 3.973866

Or,

2. To the Logarithm of 214, the whole Base add the Logarithm of 44 half the Perpendicular, the Sum will be 3.973866, and the Content 9416 as before.

The

The Base 214	—— *Log.* —	2.330414
Half the Perp. 44.	— *Log.* —	1.643452
Area —— 9416	— *Log.* —	3.973866

IV. *To Measure a* Trapezia.

A *Trapezia*, is a Figure consisting of 4 unequal Sides, and as many unequal Angles, as the Figure D.

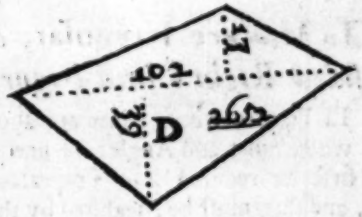
Before the *Trapezia* can be Measured, it must be reduced into two Triangles, by drawing of a Line from two opposite Angles thereof, which may be called the Common Base of both the Triangles; upon which Base, from the two opposite Angles, let fall two Perpendiculars. The Figure being thus reduced into two Triangles, may be measured as in the last foregoing precept. But more readily the two following ways.

1. The Logarithm of the Sum of the two Perpendiculars being added together, being added to the Logarithm of half the Common Base, shall give the Logarithm of the Area, or Content of the whole *Trapezia*.

Example.

Example.

In the *Trapezia* D, Let the Common Baſe be 102, and let One Perpendicular be 13, and the other 39. And let the Area be required.



The two Perpendiculars 13 and 29 added together, make 52, the Logarithm whereof is 1.716003, to which add 1,707570, the Sum of them is 3.423573, which is the Logarithm of 2652, and that is the *Area* of the *Trapezia*.

Sum of Perpend. — 52 — *Log.* — 1.716003
Half the Baſe — 101 — *Log.* — 1.707570

Area ——— 2952 — *Log.* — 3.423573

Or,

2. To the Logarithm of the Baſe, add the the Logarithm of half the Sum of the Perpendiculars, the Sum ſhall be the Logarithm of the Area, as in the Work.

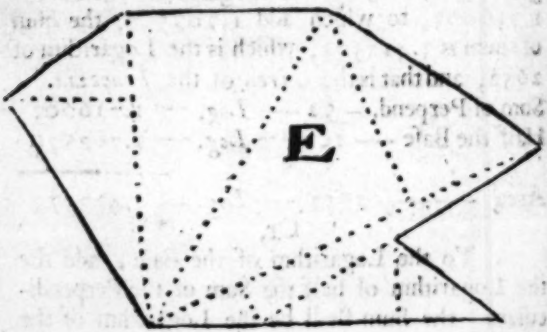
Th

The whole Base — 102 — *Log.* — 2.008600
Half Sum of Perpen. - 26 — *Log.* — 1.414973

Area as before — 2652 — *Log.* — 3.423573

V. *To Measure* Irregular, *or many sided Right Lined Figures.*

ALl Figures whose Sides are above 4, and whose Sides and Angles are unequal, must first be reduced into Trapezias and Triangles, and then must be Measured by the Rules of the two last foregoing Precepts: An Example whereof you have in the Figure noted E.



VI. *To Measure* Regular Poligons.

Regular Poligons, are such Figures as consist of equal Sides and Angles, and which may be inscribed in a Circle, and circumscribed about a Circle.

If the *Poligon* consist of	Sides it is called a
5	Pentagon
6	Hexagon
7	Septagon
8	Octagon
9	Nonagon
10	Decagon

Examples of all which you have in the following Figures, F G H K L and M.

The

Pentagon



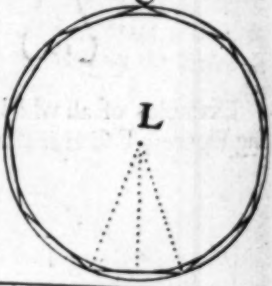
Octagon



Hexagon



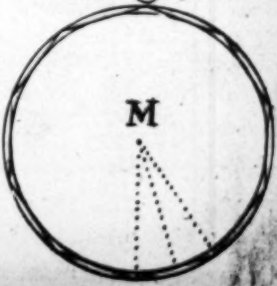
Nonagon



Septagon



Decagon



The { Pentagon, Hexagon and, Heptagon } being inſcribed within the Circle.

And,

The { Octogon, Nonagon and, Decogon } being circumſcribed about the Circle.

For the Menſuration of all theſe Regular Poligons, there is one General Rule, and that is this.

To the Logarithm of the Sum of half the Sides of the Poligon, add the Logarithm of the length of a Perpendicular let fall from the Centre of the Circle, to the middle of one of the Sides of the Poligon; the Sum ſhall be the Logarithm of the Area of the Poligon.

Example in the Pentagon marked with the Letter F.

Let the Perpendicular be 14, and let one ſide of the Poligon be 24, and let the Area of the Pentagon be required.

The Side being 24, and there being 5 of them, the Perimeter of the Figure will be 120, the half whereof is 60. Wherefore to the Logarithm of 60, add the Logarithm of the Perpendicular 14, the Sum of them is 2.924279, and the abſolute Number anſwering thereunto, is 840, and ſo much is the Content of the Pentagon F, as by the work appears.

Semi-

Semiperimeter —— 60 *Log.* —— 1.778151
Perpendicular —— 14 *Log.* —— 1.146128

Area —— —— 840 *Log.* —— 2924279

VII. *Of the* Circle.

1. *The* Diameter *being given, to find the* Circumference.

The Proportion is

As 7 is to 22.

So is the Diameter, to the circumference.

Wherefore, to find the Circumference of any Circle whose Diameter is given. Add the Logarithm of the Diameter given, to the Logarithm of 22, and from the Sum of them Subſtract the Logarithm of 7, the Remainer ſhall be the Logarithm of the Circumference ſought.

Example.

If the Diameter of a Circle be 113, what is the Circumference?

Firſt, ſet down the Logarithm of 22, to which Add the Logarithm of 113, the Diameter given, the Sum is 3.395500, from which Subſtract the Logar. of 7, and the Remainer will be 2.550402, which is the near Logarithm of 355. And ſo much is the Circumference of that Circle whoſe Diameter is 113.

See

See the Work.

22 — *Log.* — 1.342422

Diameter 113 — *Log.* — 2.053078

Sum 3.395500

7 — *Log.* — 0.845098

Circumference 355 — *Log.* — 2.550402

2. *The* Circumference *of a* Circle *being given, to find the* Diameter.

The Proportion is,

As 22 is to 7,

So is the Circumference to the Diameter.

Wherefore, To the Logarithm of 7, Add the Logarithm of the Circumference given, and from the Sum Subſtract the Logarithm of 22. The Remainer ſhall be the Logarithm of the Diameter.

Example.

If the Circumference of a Circle be 355, what is the Diameter thereof?

Firſt, Set down the Logarithm of 7, and to it Add the Logarithm of 355, the Circumferenee given, the Sum of them is 3.295326, from which Subſtract the Logarithm of 22, and the Remainer ſhall be 2.052904, which is the near Logarithm of 113, and ſo much is the Diameter of that Circle whoſe Circumference is 355.

7 —— *Log.* —— 0.845098
Circumference 355 —— *Log.* —— 2.550228

3.395326
22 —— *Log.* —— 1.342422

Diameter 113 —— *Log.* —— 2.052904

2. *The* Diameter *being given, to find the* Area *or* Superficial Content.

The Proportion is,
As 28 is to 22.
So is the Square of the Diameter to the Area:
Wherefore to the Logarithm of 22, Add the Logarithm of the Diameter doubled, (or twice) and from the Sum Subſtract the Logarithm of 28, the Remainer ſhall be the Log. of the Area.

Example.

If the Diameter of a Circle be 12, what is the Area or Superficial Content thereof?

Firſt, Set down the Logarithm of 22, and then the Logarithm of 12 the given Diameter twice, and Add all three together, the Sum of them is 3.500784, from which Subſtract the Logarithms of 28, and there will remain 2.053626, which is the Logarithm of 113, and ſome ſmall matter more, and that is the Area of the Circle.

See

See the Work.

22 —— *Log.* —— 1.342422

Diameter 12 —— *Log.* twice { 1.079181 / 1.079181

The Sum 3.500684

28 —— *Log.* —— 1.447158

Area 113 —— *Log.* —— 2.053526

4. *The* Circumference *being given, to find the* Area.

The Proportion is,

As 88 is to 7.

So is the Square of the Circumference to the Area.

Wherefore to the Log. of 7, add the Logar. of the Circumference twice; and from the Sum Subſtract the Log. of 88; the Remainer ſhall be the Logarithm of the Area.

Example.

If the Circumference of a Circle be 38, what is the Area thereof?

Firſt, Set down the Logarithm of 7, and to it Add the Logarithm of the Circumference twice, the Sum of them is 4.004664, from which Subſtract the Logarithm of 88, and the Remainer will be 2.060181, which is the near Logarithm of 115. And ſo much is the Area of that Circle, whoſe Circumference is 38.

See the Work.

7 —— *Log.* —— 0.845098

Circumfer. 38 —— *Log.* --- { 1.579783 / 1.579783

Sum -- 4.004664

88 —— *Log.* —— 1.944483

Area 115 —— *fere* —— 2.060181

THE

THE *MENSURATION* OF *Board, Glaſs, Pavement,* *Wainſcot, Plaiſtering,* and *Tyling.* By the TABLE.

I. *Of* Board.

1. *If a* Board *be* 9 *Inches Broad, how much in length thereof muſt go to make a Foot ſquare?*

FRom the Logarithm of 144 (which is the Number of Sqnare Inches in a Foot,) Subſtract the Logarithm of the Boards Breadth 9 Inches, the Remainer ſhall be the Logarithm of the length of a Foot Square.

144 -- *Log.* -- 2.158362
Breadth ——— 9 -- *Log.* -- 0.954242
Length of a Foot --- 16 -- *Log.* -- 1.204120

2. If a Board be 14 Inches broad, and 200 Inches long, how many Square Feet are contained in that Board?

Add the Logarithm of 14 the breadth, and the Logarithm of 200 the length together; and from their Sum Substract the Logarithm of 144, the Remainer shall be the Logarithm of the Content. So the Board of 14 Inches broad, and 200 Inches long, will contain 19 Feet, and somewhat more, *viz.* about $\frac{1}{3}$ a Foot.

Breadth — 14 —	*Log.* —	1.146128
Length — 200 —	*Log.* —	2.301030
Substract —		3.447158
144 —	*Log.* —	2.158362
Content in Feet 19 —	*Log.* —	1.288796.

In the working of Questions of this kind by the Logarithmical Tables, it is necessary that that measure what ever it be, whether Foot, Yard, Ell, Rod, or the like, be divided into 100 equal parts, and not the Foot into 12, as the usual manner is; And so the dimensions of any thing to be measured, must be thus taken and expressed. This being considered, I shall now proceed.

3. *A Board or Plank being 2 Foot, and 36 hundred parts of a Foot broad, and 17 Foot, and 63 hundred parts of a Foot long, how many Square Feet doth that Board contain?* Add

Add the Logarithms of 2.36, and 17.63 together; the Sum of them ſhall be the Logarithm of the Content of the Board in Feet.

But here note,

You muſt, to theſe Logarithms of whole numbers and Parts mixed together, not put the ſame Characteriſtick (or Sign ſtanding before the Comma) that you find in the Table. But

If the Integer Fig. to be Multiplyed, be in number	then the Characteriſtick muſt be
1	0
2	1
3	2
4	3
5	4

As in this Example.

	Foot. Parts.		
Length	17 . 73	*Log.*	1.246251
Breadth	2 . 36	*Log.*	0.372912
Content	41 . 61	*Log.*	3.619164

Where you ſee that the two Logar. 1.246251, and 0.372912 being added together, produce the Logarithm .619164, before which you muſt (or need) not prefix the Characteriſtick 1. but 3. the greateſt that this Table will afford; and then ſeeking the Logarithm 3.619164, in the Table you ſhall find it to ſtand againſt 41.61; ſo that the Board contains 41 Foot, and 61 hundred parts of a Foot.

4. *There is a Room whose Floor is* 16 *Foot* 75 *hundred parts broad, and* 32.25 *Foot long; How many Square Feet are therein contained?*

Add the Logarithm of 16.75, and the Logar. of 32.25 together, their Sum is (prefixing a proper Characteristick) 3.732543, the absolute number answering thereunto, is and so many Feet and parts of a Foot is contained in the Floor of that Room:

Breadth —— 16.75 — *Log.* — 1.224014
Length —— 32.25 — *Log.* — 1.508521

Content —— 540 02 — *Log.* — 3.732531

So that this Room contains in the Floor 540 Foot, and 20 hundred or 2 tenth parts of a Foot.

II. *Of Glass.*

1. *A Pane of Glass being* 1 *Foot* 32 *parts broad, and* 4.50 *parts long; how many Foot doth it contain?*

Add the Logar. of the length and breadth together, the Sum is the Log. of the content in Feet.

Example.

Foot.
Breadth — 1.32 — *Log.* — 1.120574
Length — 4.50 — *Log.* — 1.653212

Content — 5.94 — *Log.* — 2.773786

So that this Pane of Glass contains 5 Foot, and 94 hundred parts of a Foot.

2. *A*

2. *A Pane of Glaſs is .75 parts of a Foot in breadth, and of theſe in one Window there is 20, and the height of each of them is 2.5 Feet; how much Glazing is there in this Window?*

Multiply .75 by 20. Thus.

.75 —— *Log.* —— 1.875061
.20 —— *Log.* —— 1.301030

Product - 15.00 —— *Log.* —— 3.076091

The Product is 15 Foot for the common bredth: then the common height is 2.5 Feet. Wherefore Multiply 2.5 by 15, as followeth.

	Feet.		
Common breadth -	15.00	*Log.*	0.397940
Height ——	2.5	*Log.*	1.176091
Content ——	37.5	*Log.*	2574031

So that in the whole Window there is contained 37 Foot, and a half of Glazing.

III. *Of Pavement.*

There is a large Hall Paved with Marble, whoſe length is 132.2 Foot, and the breadth 56.3 foot; how many Square Feet are contained therein?

Add the Log. of the length, and the breadth together, preffxing proper Characteriſticks; the Content will be found to be 7508 Foot, and 9 tenth parts of a Foot, which is almoſt 7509 Foot, as in the *Example*.

Length — 132.2 — *Log.* — 3.121231
Breadth — 56.8 — *Log.* — 2.754248

Content - 7503.9 — *Log.* — 5.875579

If

If a Hall be 63 Foot long, and 28 Foot broad, how many ten Inch Tiles will Pave the same?

First, Add the Logar. of 63, and 28 together, their Sum is 3.246398, which is the Logarith. of 1764, and so many Square Feet are contained in the Hall. This number 1764 being Multiplied by 144, the number of Square Inches in one Foot, will produce 254016, and so many Square Inches are there in the Hall.

Now every Tile being 10 Inches Square, will Pave 100 Inches of the Hall; Wherefore, Divide 254016 by 100, (which is done by cutting off the two last Figures) and the Quotient will be 2540, and so many Tiles must there be to Pave this Hall, and 16 Inches of a Tile more.

IV. *Of Wainscoting.*

If a Room be 4 Yards, and 3 tenth parts of a Yard high, and 72 Yards and 5 parts about; how many Yards of Wainscoting is there in that Room?

To the Logarithm of the Girt about, add the Logarithm of the height; the Sum is 3.493806, the number answering thereto, is 311 7 tenths; and so many Yards of Wainscoting is there in that Room.

Girt about	72.5	*Log.*	1.860338
Height	4.3	*Log.*	1.633468
Content	311.1	*Log.*	3.493106

V. *Of*

V. *Of Plaiſtering.*

If a Cieling be 16 *Yards long, and* 9 *Yards broad, how many Square Yards are contained in the Cieling?*

To the Logarithm of the length, add the Log. of the breadth, and the Sum of them will be the Logarithm of the Content.

Length	16 *Log.*	0.204120
Breadth	9 *Log.*	0.954242
Content	144 *Log.*	2.158362.

But if the length and breadth be given in Feet, and the Content were required in Yards, As in this *Example.*

A Cieling is 48 *Foot in length, and* 27 *Foot broad, how many Yards are there in this Cieling?*

Add the Logarithms of 48 and 27 together, and from the Sum of them Subſtract the Logar. of 9, (becauſe 9 Feet are in one Yard) and the Remainer ſhall be the Logarithm of the Content in Yards, As in the following work.

	Feet.	
Length	48 *Log.*	1.681241
Breadth	27 *Log.*	1.441363
Sum		3.112604
Logarithm of 9 Subſtract		0.954242
Content in Yards	144	2.158362

VI. *Of Tiling.*

There is a Roof whose length with the Barge Courses is 96 Foot, and whose length of Rafter with the Turnings and Eves-boards is 21 Foot, How many Square of Tiling will there be to cover this Roof?

First, Set down the Log. of the length 96, and then double the length of the Rafter, which is 21 Foot, and it makes 42; the Log. whereof add to the Log. of 96, and their Sum is the Log. of 4032; and so many Square Foot of Tiling will there be in that Roof, and being that 100 Foot goes to make one Square of Tiling, cut off the two last Figures with a dash of your Pen; so shall it be 40.32, that is 40 Square, and 32 Foot. And so much Tiling will there be in that Roof.

See the Work.

Length ———	96 —	*Log.* —	1.982271
Rafters length double	42 --	*Log.* ---	1.623240
Content ———	4032 —	*Log.* —	3605511.

Which divided by 100 is 40 Square, and 32 Foot.

The

THE MENSURATION OF *SOLIDS.* AS *TIMBER & STONE,* By the TABLE.

TImber and Stone are Measured by the Foot. Wherefore let the dimensions be taken in Feet and 100 parts of a Foot.

1. *If a piece of Square Stone or timber be 2 Foot broad, 3 Foot deep, and 46 Foot long; How many Solid Feet are contained in that Piece?*

First, Set down the Logarithm of 2 the breadth, and to it add the Logarithm of 3 the depth; the Sum of them is 0778151. To which Log. add the Logar. of 46 the length, and the Sum will be 2.440901, which is the Logarithm of 276, and so

so many Solid Feet are contained in this Piece of Timber.

See the Work.

Breadth	3	*Log.*	0.301030
Depth	3	*Log.*	0.477121
		Sum	0.778151
Length	46	*Log.*	1.662758
Content	276	*Log.*	2.440909

If a Piece of Stone or Timber be 35 Inches broad, and 42 Inches deep, and 32 Foot; (or 384 inches long,) How many Solid Feet doth this Piece contain?

Firſt, Set down the Logarithm of the breadth 35, and to it add the Logarithm of the depth 42; and their Sum is 3167308. To which add the Logarithm of the Length, 384; and the Sum of them is 5.751639. From this Logarithm Subſtract the Logarithm of 1728 (which is the number of Solid Inches contained in one Foot,) and the Remainer will be 2514096, which is the Logarithm of 327 almoſt; and ſo many Feet are contained in that Piece of Timber.

See the Work.

Breadth	35	*Log.*	1.544068
Depth	42	*Log.*	1.623240
		Sum	2.167308
Length	384	*Log.*	2.584331
		Sum	4.751639
	1728	*Log.*	3.237543
Content	327 Foot *fere.*		1.514096

I might inſtance in divers other Examples of ſeveral kinds, which would rather make the Book Great, than uſeful; For whatſoever may be done by any Tables yet in being, (of this nature) may be performed by this. And for Regular Solids, and unequal ſided Board and Timber, all the precepts delivered in the foregoing parts of this Book, may be applied to the Table.

I need not ſay any thing more of the manifold uſes that this Table is ſubſervient unto; the which is ſo well known already to all Artiſts, and for other Artificers; the Precepts here delivered being general, they may make uſe of it in almoſt any thing that concerns Mundane Affairs. And therefore, to the uſes of it in this place, I ſhall at this time put

An End.

AN APPENDIX.

Shewing the further Use of the foregoing TABLES *in two Particulars, (Viz.)*

1. IN shewing how to find the Solid Content of a Piece of round Stone or Timber by Addition only.

And,

2. In *Gauging of Cask* by help of a Line or Rod of common Inches, each Inch being Divided into Ten equal parts.

All manner of Board, Glass, Stone, Timber, *&c.* may be measured by help of the Table, and the Uses of them in this Tract before delivered. But for variety, I shall add some for the Uses of the same Tables, whereby you shall find the Content or Solid Capacity of Round or Circular Solids, as Trees, Columbs of Wood or Stone, *&c.* And also in the *Gauging of Cask*,

I. *How*

16 NO 1925

1. *How to Measure Round or Circular Solids.*

For the Measuring of these *Circular Solids* this number is always to be had in remembrance, namely, [6,65772]

Having this number, set it down, then having taken the Diameter of the *Column* in Inches, set down the Logarithm thereof two times, under this constituted number; Lastly, set down the Logarithm of the length in Inches, and add all these four numbers together, the sum of their cutting off with your Pen, the last Figure toward your left hand) shall be the solidity of the Piece of *Stone*, or *Timber* required.

Example I.

If a round Column or Pillar of Stone or Wood, *be* 35 *Inches Diameter, and the length of the same be* 364 *Inches, how much doth the Piece contain?*

1.	Set down the constituted number,	8,65772
2.	The Logar. of 35 Inches, the Diam. 35	1,54406
3.	The same again,	1,54406
4.	The Logar. of 364, the length, 364	2,56466
	The Logarithm of 205	2,31050

Which 205 is the neareſt number in the Tables; and therefore the Colum of Stone or Timber contains almoſt 205 Foot.

IRREGULAR PAGINATION.

A

Shew

gi

1. IN ſhewing how to find the Solid Content of a Piece of round Stone or Timber by Addition only.

And,

2. In *Ganging of Cask* by help of a Line or Rod of common Inches, each Inch being Divided into Ten equal parts.

All manner of Board, Glaſs, Stone, Timber, *&c.* may be meaſured by help of the Table, and the Uſes of them in this Tract before delivered. But for variety, I ſhall add ſome for the Uſes of the ſame Tables, whereby you ſhall find the Content or Solid Capacity of Round or Circular Solids, as Trees, Columbs of Wood or Stone, *&c.* And alſo in the *Ganging of Cask*.

16 NO 1935

I. *How*

1. *How to Measure Round or Circular Solids.*

For the Measuring of these *Circular Solids*, this number is always to be had in remembrance, namely, [6,65772]

Having this number, set it down, then having taken the Diameter of the *Columb* in Inches, set down the Logarithm thereof two times, under this constituted number; Lastly, set down the Logarithm of the length in Inches, and add all these four numbers together, the sum of their cutting off with your Pen, the last Figure toward your left hand) shall be the solidity of the Piece of *Stone*, or *Timber* required.

Example I.

If a round Columb or Pillar of Stone or Wood, *be* 35 *Inches Diameter, and the length of the same be* 364 *Inches, how much doth the Piece contain?*

1. Set down the constituted number,		6,65772
2. The Logar. of 35 Inches, the Diam. 35		1,54406
3. The same again,		1,54406
4. The Logar. of 364, the length,	364	2,56466
The Logarithm of	205	2,31050

Which 205 is the neerest number in the Tables, and therefore the Colum of Stone or Timber contains almost 205 Foot.

AN APPENDIX.

Shewing the further Use of the foregoing TABLES *in two Particulars, (Viz.)*

1. IN shewing how to find the Solid Content of a Piece of round Stone or Timber by Addition only.

And,

2. In *Gauging of Cask* by help of a Line or Rod of common Inches, each Inch being Divided into Ten equal parts.

All manner of Board, Glass, Stone, Timber, *&c.* may be measured by help of the Table, and the Uses of them in this Tract before delivered. But for variety, I shall add some for the Uses of the same Tables, whereby you shall find the Content or Solid Capacity of Round or Circular Solids, as Trees, Columbs of Wood or Stone, *&c.* And also in the *Gauging of Cask*.

16 NO 1925

I. *How*

1. *How to Measure Round or Circular Solids.*

For the Measuring of these *Circular Solids*, this number is always to be had in remembrance, namely, [6,65772]

Having this number, set it down, then having taken the Diameter of the *Column* in Inches, set down the Logarithm thereof two times, under this constituted number; Lastly, set down the Logarithm of the length in Inches, and add all these four numbers together, the sum of their cutting off with your Pen, the last Figure toward your left hand) shall be the solidity of the Piece of *Stone*, or *Timber* required.

Example I.

If a round Column or Pillar of Stone *or* Wood, *be* 35 *Inches Diameter, and the length of the same be* 364 *Inches, how much doth the Piece contain?*

1.	Set down the constituted number,	6,65772
2.	The Logar. of 35 Inches, the Diam. 35	1,54406
3.	The same again,	1,54406
4.	The Logar. of 364, the length, 364	2,56466
	The Logarithm of 205	2,31050

Which 205 is the neareſt number in the Tables; and therefore the Colum of Stone or Timber contains almoſt 205 Foot.

Example II.

If the Diameter of a round Column be 15 Inches, and the length thereof be 105 Inches; how many solid Feet are contained in that Column?

1. The constituted number, ——— 6,65772
2. The Log. of the Diameter, —15— 1,17609
3. The same again, ——— 15— 1,17609
4. The Logar. of the length, —105— 2,02118

The Logar. of ——— 10.74— 1,03108

Which 10.74 is 10 Foot, and 74 hundred parts of a Foot; and so many Foot are contained in that Column of Stone or Timber, that is 10 Foot, and three quarters.

Note. If the Columb, or Pillar, or other round body be not equal at both ends, take the Diameter about the middle thereof for a Mean.

The Use of the Tables in Gaging *of* Cask.

For the finding of the content of any Vessel, three Lines must be first measured with a Rule, or Rod; namely,

1. The Diameter of the Heads.
2. The Diameter of the Bongs.
3. The length of the Vessel.

And

And these three lengths must be measured by a Line of Inches, each Inch being divided into 10 parts, for that is the most convenient of any other. For in taking of your Dimensions, if you put your Rod into the Bong of your Cask, and put it to the bottom right there-against, and find it 30 Inches deep, you need but add a Cypher thereunto, and it will be 300, and so are your Inches easily reduced into hundred parts. — But if the Diameter at the Bong had not been even Inches, as in the last, but it had been 30 Inches, and 6 tenth parts of an Inch, then in stead of adding a Cypher to the 30, add 26, so will the Diameter at the Bong be 306 parts, and so of any other number of parts.

Thus have you attained to the Diameter at the Bong. Now for the Diameter at the Head, taking the greatest length without, and making an allowance (according to discretion) for the thickness of the same, which Diameter at the Head we will suppose to be 24 Inches, and 2 parts, that is reduced 242 parts.

These two being attained, The next length or Measure, is, the length of the Cask, which must be taken in the inside of the Cask between Head and Head, by means of some Instrument to slip in and out; and we will suppose this length to contain 50 Inches, 6 parts; And thus have you found

The Diameter at the Bong, 30.6
The Diameter at the Head, 24.2
The length of the Veſſel, 50.0

It reſteth now to find a Mean Diameter between that of the Head, and that of the Bong, which you may thus attain.

1. Add the Diameter of the Head, and the Diameter of the Bong together, and half of that ſum reſer.

2. Take the difference between the Diameter of the Head and Bong, and add a fourth part thereof to the former reſerved number, the ſum of thoſe ſhall be the Mean Diameter ſought.

Example in the forementioned Caſk.

The Diameter at the Head, 24.2
The Diameter at the Bong, 30.6
Their ſum, 54.8
Half their ſum 27.4 Reſerve.
The difference of the Diameters at Head and Bong, 6.4
A fourth part thereof, 1.6
The Mean Diameter, 29.0

Being thus prepared, you may attain to the content of the Cask, as followeth.

1. Set down the conſtituted number [453165.]
2. Set down the Logarithm of the Mean Diameter twice.
3. Set down the Logarithm of the length.
4. Add theſe three numbers together, and cutting off the laſt figure towards your left hand, the reſt ſhall be the Logarithm of the content of the Veſſel.

Example.

Conſtituted number,	4.53165
The Log. of the Mean Diameter, 290	2.46239
That again,	2.46239
The Logarithm of the length, 506	2.70415
The Logarithm of 144 neareſt,	2.16058

So that the Cask contains 144 Gallons, and ſomewhat more, becauſe the Logarithm found, is greater than the Logarithm of 144. And how much more than 144 Gallons the Veſſel doth hold, you may thus find.

1. Take the difference between the Logarithm of 144 and 145, which you will find to be 300, this number muſt be your Diviſor.

2. Take

3. Take the difference between the Logarithm of 144, and the Logarithm found, which you will find to be 232.

4. Multiply this 232 last found by 8, (for there be 8 Pints in one Gallon,) and the Product shall be 1776 for your Dividend.

5. This 1776 being divided by 300, giveth in the Quotient 6 *fere*, and so the content of the Vessel is 144 Gallons, and 6 Pints almost.

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A

Num	Logarithm	Num	Logarithm	Num	Logarithm
9976	3.998956	9986	3.999391	9996	3.999826
9977	3.999000	9987	3.999435	9997	3.999869
9978	3.999043	9988	3.999478	9998	3.999913
9979	3.999087	9989	3.999522	9999	3.999956
9980	3.999130	9990	3.999565	1000	4.000000
9981	3.999174	9991	3.999609		
9982	3.999217	9992	3.999652		
9983	3.999261	9993	3.999695		
9984	3.999304	9994	3.999739		
9985	3.999348	9995	3.999782		

THE

THE

A Supplement,

Wherein is contained and plainly demonſtrated the Uſe of the

Scale of *LOGARITHMS*,

(Vulgarly known by the name of

Gunters-Line,)

In *Arithmetick* and *Geometry*.

But more particularly applied to

The Menſuration of *Superficies* and *Solids*; as *Board*, *Glaſs*, *Floors*, *Partitions*, *Pavement*, *Wainſcot*, *Brick-work* and *Tiling*.

As alſo,

How to meaſure *Stone*, *Timber* ſquared or circular, *Cones*, *Cylenders*, *Cask*, &c.

With diverſe other things of good uſe for all Artificers, and ſuch as practiſe the commendable Art of

MENSURATION.

By *John Wiblin* Carpenter. *Philom.*

London, Printed for *Richard Jones*, A. D. 1669.



I. THE DESCRIPTION Of the *Line of Numbers.*

THis Line is nothing else but the foregoing Table of Logarithms projected upon a Rule, the manner how it is inscribed thereon, is well known to the Instrument-maker, and therefore needs no discourse thereof in this place.

You are to understand that this Line is vulgarly made after this form, viz. At the beginning thereof is placed the figure of 1. and so proceeds from 1. to 2. and from 2. to 3. 4. 5. 6. 7. 8. 9. unto 1. again, placed in the middle of the Rule, which proceeds in the same order to the other end of the Rule, ending with 10.

This 1 at the begining of the Rule sometimes represents 1 onely, and then that in the middle signifies 10. and that at the other end 100.

Again, if 1 at the begining denotes 10. then 1 in the midst is 100. and 1 at the end 1000. so that for any number under 1000. the figures very readily direct you.

Note farther, as the whole Line is divided into 100 parts: so is each of those parts subdivided into 10 parts more, or as the length thereof will permit, more or less, in decuple or tenfold order.

II. *Numeration or Notation upon the Line of Numbers.*

ANy number under 1000 being given, to find the point on the Line representing the same.

RULE.

Make search for the first figure of your number, amongst the figured divisions. In the next place, for your second figure, count so many tenths from the long divisions, forwards on, towards the end of the Rule, (*viz.* next the right hand) as the second figure amounts unto; or if it be three figures, account from the last figure so

so many centisms as that figure hath unites; and if there be four figures, you must make as near an estimation thereof in the same order, as you can by your eye, and the length of the Line will permit.

Example 1.

Let the number proposed be 12. to find the point on the Rule representing the same.

Here you see 1 is the first figure, which I chuse in the middle of the Rule, and by reason 2 is the second figure, I count two tenths farther towards the right hand, and that is the place or point of 12 required; where 'tis frequent to have a brass Center pin, by reason of its often use.

Example 2.

Suppose the point which represents 144 be required upon the Rule.

Here in this case I make choice of 1 in the middle for the first figure, and for 40 the second figure I account 4 tenths forward, and for 4 the last, I reckon 4 Centisms or hundredth parts, which is the point desired.

Example 3.

Again, since I would find the point which represents 1728. the cube Inches in a foot solid.

To perform this, I take 1 in the middle of the Line, for the second figure 7 I account 7 tenths, which denotes 700. and for the third figure 2,

I reckon 2 Centisms from the the tenths, which represents 20, and for 8 make as near an estimation as you can for the thousand part, (except your Line be long enough to have those subdivisions.)

This will be better understood by little practice than by many words, and to an ingenious headpiece cannot be difficult to apprehend.

III. *How to find a fraction on the Line of Numbers.*

THese you are to note are expreſt upon the Line no otherwise than Decimal fractions, as thus, *viz.*

$\frac{1}{10}$ $\frac{1}{100}$ $\frac{1}{1000}$ (or thus.

1,01. 001. 0001. &c.

And thus you must understand them whether inches, feet, yards &c. and thus all other fractions must be reduced upon decimals, and upon this consideration they are expreſt as whole numbers upon the Line.

Probl.

Probl. I.

To multiply two Numbers given by the Line of Numbers.

THe proportion is, As 1 is to the *Multiplicand*: so the *Multiplicator* to the *Product*.

RVLE.

So that if you extend the Compasses from 1 to either of the numbers to be multiplied, that extent will reach the same way from the other number to the Product.

Example 1.

As 1 to 4: so 7 to what? Or,

As 1 to 8: so 5 to what?

First, I extend my Compasses from 1 to 4, and that extent will reach from 7 the same way to 28, or from 1 to 7 will reach from 4 to 28.

And so the extent from 1 to 8 shall reach from 5 to 40, according to the same method.

Now, if you are at a stand to know what number of places are contained in the *Product*: Note that the *Product* always contains as many figures, as are in the *Multiplicand* and *Multiplicator* both, unless the two first figures of the *Product* be greater than the two first figures in the *Multiplicater*; if so, the *Product* must have one

one figure less than are in the *Multiplicator*, and *Multiplicand*.

Thus 47 multiplied by 25 is 2175, but 16 by 16 is 240, and consists but of three places for the aforesaid reason.

Prob. II.

To Divide one Number by another.

THe proportion is, As the *Divisor* is to 1: so is the *Dividend* to the *Quotient*.

This is not much different from the work in Multiplication upon the Line, it being the converse.

Example 2.

I would divide 40 by 5, therefore I extend the Compasses from the *Divisor* 8 to 1. The same extent will reach from the *Dividend* 40, the same way to 5 the *Quotient*.

But in greater Divisions by the Line to know the number of figures in the *Quotient*, take this

Note the difference of the numbers of places of figures in the *Dividend* and *Divisor*; then in case the quantity of the two first figures to the left hand in your *Divisor*, be less than the quantity of the two first figures to the left hand in your

your *Dividend*, the *Quotient* shall have one figure more than the number of difference: But where the quantity of the two first figures of the *Divisor*, is greater than the quantity of the two first figures of the *Dividend*, the *Quotient* will have onely that number of figures noted by the difference. So 245 divided by 15, will have two figures in the *Quotient*; but divide 240 by 36, and there will be but one figure in the *Quotient*.

The Use of the Line of Numbers, in measuring any superficial measure, as Board, Floors, Wainscot, Glass, &c.

The common way of measuring is with a two foot Rule, divided into 24 equal parts or inches, each inch being subdivided into halves, quarters, and half quarters, for the exact taking of dimentions, but this is not so agreeable to the Line, as foot measure is, and therefore he that would measure by Mr. *Gunter's* Line, ought to have a Line of foot measure upon his Rule, which is only a foot divided into 10 equal parts, each part subdivided into 10 more smaller divisions, and being thus prepared, you shall thereby ease your self very much in your measuration.

Prob.

Prob. III.

Having the breadth of any superficies given in inches, and the length in feet, to find the content in feet.

Example 3.

Let the breadth given be 25 inches, and the length 19 foot 2 inches; extend the compasses from 12 to 25, the breadth in inches, and that extent will reach from 19 foot 2 inches the length, being once repeated upwards towards your right hand, to 46 foot, the content required.

Prob. IV.

Having the breadth and length of any superficies given in inches, to find the content in feet.

THE proportion is, As 144 inches (the number of square inches in a superficial foot) is to the breadth in inches: so is the length in inches to the content in feet.

Example

Example 4.

Extend the Compasses from 144 to the breadth 25 inches, and that extent will reach from 230 inches the length, to 40 foot, the content as before.

Prob. V.

Having the breadth and length of any oblong Superficies given in inches, to find the content in inches.

THe proportion is, As 1 inch to the breadth in inches: so is the length in inches to the content in inches.

Example 5.

Extend the Compasses from 1 in the middle of the Rule, to 25 inches the breadth, and that extent will reach from 230 the length in inches, to 5750 the content in inches.

Now to bring these numbers of inches into feet, extend the Compasses from 1 in the middle of the Line, to 144, and that extent of the Compasses will reach from 5750 (the whole number of inches) to 40 the content in feet, as before, the Compasses being once turned downward towards the left hand.

Prob.

Prob. VI.

How to meaſure any ſuperficies by the Line of foot meaſure, which is performed onely by Multiplication.

ADmit a board be 1 foot 5 tenths of a foot broad, and 20 foot long, how many feet are in ſuch a board?

Example 6.

Extend the Compaſſes from 1 in the middle of the Rule (or Line) which is 10, the ſide of a ſquare foot, to the fift and longeſt diviſion, between 1 and 2, and that extent will reach from 20 foot the length, to 30 foot the content.

But if you would have the content in parts of a foot, you are to work thus: Extend the Compaſſes from 1 or 10 in the middle of the Rule to 15 the breadth, which is 1 foot 5 parts, and that extent will reach from 200, the number of parts in the whole, to 3000, which is the whole content in parts.

To bring this number of parts into feet, obſerve this Rule. Account how many hundreds or how many thouſands, ſo many ſquare feet is in that ſuperficies: or ſo many thouſands you have, ſo many 10 foot there is, which is but the ſame thing.

But

But if you measure board that is under a foot broad, then observe to turn the Compasses downwards towards your left hand.

Example 7.

Admit a board 9 inches broad, and 10 foot long; extend the Compasses from 12 to 9, the same extent will reach from 20 to 15, the content required.

To measure Glass or any other Superficies, is in effect but the same thing.

Example 8.

Suppose I have a piece of Glass 18 inches broad, and 40 inches in length, extend the compasses from 144 to 18 the breadth, and that extent will reach from 40 the length, to 5 foot and a quarter the content. Or thus, by foot measure, extend the Compasses from 10 to 15, and that extent will reach from 35 the length, to 5 foot and a quarter, the content as before.

Prob.

Prob. VII.

Having the breadth and length of any Superficies, either Plaistering, Wainscot, Hangings &c. in foot or inch measure, to find how much in length countervails a superficial foot in the same measure.

THe Rule is this; Divide 144 the superficial inches of a foot in inch measure, or 1000 the superficial inches of a foot in foot measure, by the breadth (viz. the height of your room taken in the same measure;) and the *Quotient* gives the number of inches you are to measure forward for a square foot, which upon the Line is thus performed: Admit the breadth given ,78 parts of a foot, the extent from ,78 to 1, shall reach from 1 to 1.28: so that 1 foot and 28 parts in length, contains a superficial foot at that breadth. And after the same manner in inch measure, the breadth being given 14, 25, (viz. a quarter) the length of a foot will be found 10 inches 1 10th. and a half; The same method is to be followed in measuring of board, where note, if it be broader at one end than the other, you are to take the *Arithmetical mean*, viz. add the breadth of both ends together, and take

take half for a mean breadth.

And for measuring of Floors, Partitions, and such like, 'tis but multiplying the length by the breadth, and the *Product* gives the content desired.

Prob. VIII.

There is a Roof which is 16 foot and a quarter broad, how much thereof makes a square, which is 10 Foot every way?

HEre if you divide 100 by 16, 25, the *Quotient* will be 6 and 15 parts, or rather 2 parts almost: so that if you extend your Compasses from 16 to 1, the same extent will reach from 1 to 6 and 2 parts *ferè*, and so much in length shall be an exact square.

Probl. IX.

There is a certain Yard to be paved, which is 17 foot 33 parts broad, how much in length makes a yard?

FOr this here is your Rule: Divide 9 the square feet in a yard, being increased by cy-

phers

phers at pleasure, by 17, 33 the breadth, the *Quotient* gives 052, which is the length of one yard; so that if you extend the Compasses from 17, 33 to 1, the same extent will reach from 9 the square feet in a yard, to 5. 2 parts *ferè* of a foot, accounted towards the left hand; and the *ferè* 5 parts of a foot and 2 10ths in length, contains a square yard.

Prob. X.

Admit there be a certain House tiled, whose bredth is 16 foot and a quarter, and length 47 feet, I would know how many squares of Tiling is contained therein.

I Double the length (thereby to take in both sides of the Roof) which amounts to 94, which multiplied by 16, 25 produces 1527,5. this *Product* divided by 100. and the *Quotient* is 15 and 28 parts *ferè*, the content of the Tiling. Which is most easily performed by the Line on this manner: For first the extent from 1 to 94 will reach from 16, 25 towards the left hand unto 15, 27 and half, the *Product*; which to divide by 100 onely cuts off 2 figures as a fraction towards the right hand, and the *Quotient* is 15 squares and 28 parts *ferè*, viz. a little above a quarter more.

Prob.

Prob. XI.

To find the Content & Area of a Triangle.

First, you are to take the nearest distance or length between the *Base* and opposite angle, so having this perpendicular length, and the *base* in any kind of measure, viz. foot or inch measure; Multiply the one into the other, and half the *Product* is the *Content*: or multiply half the *Base* by the whole *Perpendicular*, or the whole *Perpendicular* by half the *Base*, and the *Product* gives the *Content* desired.

Example.

Thus having the like end of a Roof, 28 foot for the *Base*, and 12 foot for the *Perpendicular*, these drawn one into the other by the Rule of Multiplication, produces 336 feet, whose half is 168 feet for the *Content* desired: or if you multiply half 28; *viz.* 14, by 12; or half 12, *viz.* 6, by 28, the *Product* is the same. *And thus you may measure the Gable end of a house, or the hip end of a Roof.*

How to measure Irregular Superficies.

This is done by reducing them into *Trapezaes* and *Triangles*, which is largely shewn in the former part of this Book, and therefore I shall forbear speaking any thing thereof.

But note, if you have an *Equilateral Triangle* to measure, *viz.* every side equal in length; you may measure it by this proportion: As 1 to 433. 013: so the side of the *triangle* given in feet and inches *&c.* to the *Content*, without finding a *Perpendicular*.

Probl. XII.

The Diameter of a Circle given, to find the Circumference by the Line.

SAy first, As 7 is to 22, or as 1 into 3 14: so the *Diameter* to the *Circumference*: Thus suppose the *Diameter* be 12 inches, the *Circumference* will be found 37 and 70 parts of an inch almost; so that if you extend the Compasses from 7 to 22, or from 1 to 3,14, the same extent shall reach upon the Line from 12 to 37, and 70 parts almost, or if the *Diameter* were 20, the same extent will reach from thence to 63,

the true *Circumference* desired. Or having the *Circumference*, you may find the *Diameter*, if you say, As 22 to 7, or as 1 to 0,318 : so the *Circumference* to the *Diameter*, which is wrought upon the Line in the same manner as the former.

Prob. XVIII.

Having the Diameter of a Circle to find the superficial content, and the converse.

THe proportion is thus; say, As 14 to 11, or as 28 to 22, or as 1 to ,079 : so is the square of the *Diameter*, (which is onely the *Diameter* multiplied into it self) to the Area or superficial content.

Otherwise you may reason thus, As 1 is to 3,14: so is the square of the *Radius* or *Semidiameter* to the *Content* as before.

So. for example, in the former *Circle* whose *Diameter* was 12, the *Content* will be found 113 and better. For if you extend the Compasses from 1 to 3,14, the same extent of the Compasses shall reach from 36 (the square of the *Semidiameter*) or from 144, the square of the whole *Diameter*, to 113 and better, the Area desired. In like manner the extent of the compasses from 14 to 11, or 28 to 22, shall reach

from 144 the same way downwards, to the *Content*, 113 as before.

Now the *Converse* of this *Problem* is by changing the proportion, having the *Area* to find the *Diameter*; therefore say, as 11 to 14, or as 22 to 28 *&c.* So the *Area* to the square of the *Diameter* desired; and this is wrought in all respects like the former upon the Line.

And after this manner you may measure the *Content* of any Circular Form, as Glass, (which is often for ornament wrought into that Form of Circles) and here I may hint, that there is no necessity to express all particular Forms that are to be measured in superficial measure, since the former Rules are variously applicable.

Prob. XIV.

How to measure a square Solid, as Timber, Stone, or such like.

THe Rule is, first to find the *Area* of the *Base*, (or one of the ends in inches) and multiply that into the length, gives the *Content* in inches, which divided by 1728, the *Quotient* is the *Content*.

Example.

Admit the piece of Timber be 16 inches square.

ſquare, and 18 foot long, there will be found 32 foot in that ſolid: For extend the Compaſſes from 12, the ſide of a foot, to 16 inches the ſide given, the ſame *extent* twice repeated ſhall reach to 32 the ſolid feet in that piece.

Prob. XV.

How to meaſure a piece of timber by the Line, whoſe ſides are unequal.

HAving the two ſides given, multiply one into the other, from which *Product* extract the ſquare *Root* (which is onely to divide the ſpace between thoſe two numbers or ſides into two equal parts upon the Line, and the point of the Compaſſes falls upon the *Root* deſired; or having the *Product* of the two unequal ſides given, extend the Compaſſes from 1 to that *Product*, and the middle between thoſe two numbers is the *Root* required) thus having obtained the ſide of the true ſquare, extend the Compaſſes from that point to 12, the ſame *Extent* ſhall reach from the length to the *Contents*, being twice repeated, as before in the other.

Example.

A timber one ſide be 13 inches, and the other 17, the middle way between theſe two numbers

from 144 the ſame way downwards, to the *Content*, 113 as before.

Now the *Converſe* of this *Problem* is by changing the proportion, having the *Area* to find the *Diameter*; therefore ſay, as 11 to 14, or as 22 to 28 *&c.* So the *Area* to the ſquare of the *Diameter* deſired; and this is wrought in all reſpects like the former upon the Line.

And after this manner you may meaſure the *Content* of any Circular Form, as Glaſs, (which is often for ornament wrought into that Form of Circles) and here I may hint, that there is no neceſſity to expreſs all particular Forms that are to be meaſured in ſuperficial meaſure, ſince the former Rules are variouſly applicable.

Prob. XIV.

How to meaſure a ſquare Solid, as Timber, Stone, or ſuch like.

THe Rule is, firſt to find the *Area* of the *Baſe*, (or one of the ends in inches) and multiply that into the length, gives the *Content* in inches, which divided by 1728, the *Quotient* is the *Content*.

Example.

Admit the piece of Timber be 16 inches ſquare,

ſquare, and 18 foot long, there will be found 32 foot in that ſolid: For extend the Compaſſes from 12, the ſide of a foot, to 16 inches the ſide given, the ſame *extent* twice repeated ſhall reach to 32 the ſolid feet in that piece.

Prob. XV.

How to meaſure a piece of timber by the Line, whoſe ſides are unequal.

HAving the two ſides given, multiply one into the other, from which *Product* extract the ſquare *Root* (which is onely to divide the ſpace between thoſe two numbers or ſides into two equal parts upon the Line, and the point of the Compaſſes falls upon the *Root* deſired, or having the *Product* of the two unequal ſides given, extend the Compaſſes from 1 to that *Product*, and the middle between thoſe two numbers is the *Root* required) thus having obtained the ſide of the true ſquare, extend the Compaſſes from that point to 12, the ſame *Extent* ſhall reach from the length to the *Content*, being twice repeated, as before in the other.

Example.

A piece one ſide be 13 inches, and the other 17, the middle way between theſe two numbers

upon the Line, falls upon 14,4 *fere*, which is the *Root* of that *Product*, *viz.* of 221; that point so resting, extend the other to 12, upon the Line, and that *Extent* being twice repeated, will reach from the length 19 foot and a half, to the *Content* 30 foot. And thus a ſtone Peer may be meaſured according to the ſame method, or any other ſolid equivalent.

Prob. XVI.

Having the Area of the Baſe of a Solid, to find how much in length makes a foot forward, &c.

IF the ſides be either equal or unequal, the *Area* is eaſily gotten by multiplying one ſide into the other, which *Product* is to be a *Diviſor*, and the *Dividend* 1. or 1000, &c. and the *Quotient* is the length of a foot ſolid required.

Example.

Admit a piece of Timber be 1 foot 75 parts or three quarters one way, and the other way be 1 foot and 25 parts or a quarter, the *Reſtangle* of theſe two will be 2 foot 188 parts *fere*; then I extend the Compaſſes upwards from 2,188. to 1. and the ſame *Extent* of the Compaſſes will reach from 1 downwards, to 0,457 parts,

parts, and so that 4 parts and 57, forward upon that solid, is equal to a foot in foot measure.

Probl. XVII.

How to measure a round Solid or Column, Cylender or Pillar, &c.

TO perform this, take the *Diameter*, and by that find the *Area* of the *Base* or Circle at one end, *viz.* the *Content* in inches, which multiplied by the length in inches, gives the *Content* in solid inches, which divided by 1728. the solid inches in a foot, the *Quotient* is the *Content* in feet. Otherwise thus; having the *Area* or *content* of the *Base* (as is before shewed *Prob.* 13.) find the square *Root* thereof as before directed, and then 'tis reduced into an even square solid, and measured in all respects as was shewed *Prob.* 14. and therefore Examples are needless here: if you would know how much in length makes a foot, having the *Area* of the *Base*, work as you are directed in the last *Problem*, and you shall obtain your desire.

Probl.

Prob. XVIII.

How to measure Square or Round Timber that is bigger at one end than the other.

THe Rule is thus: First find the *Area* of both ends, (as is already shewed) which are usually termed their *Bases*, multiply these 2 *Bases* one into the other, and extract the square Root of that *Product* as before, add both the *Bases*, and the square Root together, and multiply the Sum thereof by one third part of the length, and the *Product* will be the *Content* required.

As for example.

Suppose a piece of Tapering Timber be 12 foot long, and 2 foot 0 and the breadth of the *Base* be the greater end 1 foot 3 quarters, or 75 parts, and the depth 1 foot 50 parts, which multiplied together produces 1 foot 50 parts for the *Content* of the greater *Base*: Now the *Base* at the lesser end is in breadth 1 foot 2 parts, and the thickness or depth suppose 91 parts of a foot; these two multiplied together, produce the lesser *Base* 1 foot 002 hundred parts of a foot. These two *Bases* drawn into each other, pro-

produce 2,52252 the square *Root* whereof is 1,588 and better; unto which add the sum of both the *Bases* the *total* will be 4,99 which being multiplied by 1 third part of the height, *viz.* 4,2 the *Product* will be 20 foot and 96 parts for the exact *Content* of the said piece in foot measure.

This is somewhat tedious, I must confess, for Workmen in their practise; but I inserted it the rather, because it is an exact *Geometrical* and *demonstrative* way, and the truest way for exact *Mensuration* of such Solids; although for common ordinary Timber, that old way of taking the Compass or Span in the middle for a mean, may serve; and what is here mentioned of measuring these kind of Solids, which are the *Segments* of *Cones* and *Cylenders*, may also be understood in the *Mensuration* of Brewers Tunns, either round or square.

Prob. XIX.

How to measure a round body, viz. a Globe, Sphere, or Ball the Diameter thereof being given, which is easily obtained by help of a pair of Callipers.

The proportion is as 21 to 11, or if you please as 1 to

952, so is the *Cube* of the *Diameter* to the Content required.

Note, That the *Cube* is only the *Diameter* multiplied into it self, and that *Product* multiplied again by the *Diameter*, produces the *Cube*: Thus a *Sphere* whose *Diameter* or *Axis* is 12 inches, will be found to contain 905 feet and 62 parts; For extend the Compasses from 21 to 11, the same will reach from 1728, the *cube* of the *diameter*, to 905 and better, *viz.* almost 906 feet.

Prob. XX.

How to measure any Cask, Barrel, Pipe, Hogshead or other Vessel &c.

FIrst take the *diameter* at Bung in inches and parts, also the *diameter* at head in the same measure, together with the length. Secondly, By the Rules before given find the *Area* of those 2 Circles; having so done, take one 3d part of the *Area* at bung, and 2 3d parts of the *Area* at head, and add them together: and thus your vessel is reduced into a *Cylinder*. Then multiply that product by the length, gives the *content* in solid inches, which divided by 231 for Wine, or 282 for Beer and Ale, gives the true *content* in Wine or Ale Gallons.

Ex-

Example.

Admit a Veſſel whoſe *diameter* at head is 18 inches, and at bung 32, but the length 40 inches; by the foregoing Rules one ⅓ of the *Area* of the Circle at head will be found 268,2 which doubled and added to the one ⅓ of the *area* of the Circle at bung 84,9, the ſum will be 621,3 for the ſum of the mean *cylinder*; which multiplied into the length 40, by the Line as before taught, produces the *contents* of the Cask or veſſel in ſolid inches, *viz.* 24852, which divided by the cube inches of a gallon of Wine 231, gives in the *Quotient*, as you may find by the Line according to the former directions, 107 Gallons 58 parts, the true *contents* of the Cask required.

Having briefly ſhewed by theſe Twenty Problems *how to meaſure divers ſuperficies and ſolids by the help of* Gunters *Line, or the Line of Numbers: in the next place I ſhall add ſome few practical eaſie* Queſtions, *as a further variety for Workmen, and ſo conclude my* Supplement.

Queſt.

Question I.

There is a Floor which contains in length 17 foot 8 inches, and breadth 16 foot 6 inches: I would know how many superficial feet is contained therein.

But before I shew the manner of work, let these things be observed.

First, you are to note that *feet* multiplied into *feet*, produce square *feet*.

Secondly, *Inches* multiplied into *inches*, produces square *inches*, or long *inches* and square *inches*, provided the *Product* amounts to above 12.

Thirdly, Note that 12 square *inches* make 1 long *inch*, and 12 long *inches* make one superficial *foot*.

Fourthly, *Feet* multiplied by *inches*, or *inches* by *feet*, produce long *inches*, or *feet* and long *inches*, if the *Product* be above 12.

This being premised, *Multiplication* of *feet* and *inches* without *Reduction*, and so all Questions depending thereon, may easily be performed thus. As for example, in the aforesaid Question *17 foot 8 inches* by *16 f. 6 in.* I place them thus one under another, as you see:

	17	8
	16	6

Then

Then I begin and multiply 16 by 17, according to the Vulgar Rules of *Multiplication*, and the *Product* ſtands thus

102
17
---
272 : 0

Secondly, I multiply croſs 17 by 6, for which I ſay 1/7 halves is 8 and a half, which I alſo ſet down in order, and likewiſe 16 by 8 croſs; or rather for eaſe of memory, ſay 16 halves is 8 *foot*, and then 16 times 2 that remains, is 32 long *inches*, that is 2 *foot* 8 long *inches*; this added to the former 8 *feet*, produces 10 *feet* 8 long *inches*, which I alſo ſet down under 8 *foot* 6 *inches*, as in the margin.

08 : 6
10 : 8
00 : 4
---
291 : 6 *Product.*

Laſtly, I multiply 6 by 8, which is 48 ſquare *inches*, that is 4 times 12, therefore 4 long *inches*, which 4 I place under 8, and add them all together, begining at the right hand, ſtill carrying the twelves to the next place, and ſo the *Product* will be 291 ſquare *feet* and 6 long *inches* or half a foot more. After the ſame manner you are to work in all ſuch like caſes.

Or if this were to be reduced into ſquares, then 'twould be 2 ſquare 91 *foot* and a half; or if into ſquare yards, by dividing by 9, the ſquare *feet* in a yard, the *Quotient* would be 32 yards and 3 10ths of another, *viz.* a little above a quarter.

So

So if I were to multiply 19 *feet* 5 *inches*, by 11 *foot* 7 *inches*, the *Product* would be found 224 ſquare feet 10 *long inches* and 11 *ſquare inches*, that is, very near 225 *feet* : and the work will ſtand thus, according to the Rules laid down.

19—5
11—7

f. 19		
19		
l.	*in.*	*ſq.i.*
209	0	0
9	6	0
1	7	0
4	7	0
0	2	11
224	10	11

Queſtion II.

I. *There are two party Walls in a Cellar which are each of them* 29 *foot long, theſe two added together amount to* 58 *feet in length, which multiplied into the height* 7 *foot produces* 406 *feet at two bricks thick.*

II. *The fore-wall and back-wall are in length* 15 *foot,*

foot being added amount to 30, which drawn into the height 7 foot, produces 105 foot at two bricks and a half thick.

III. *There is also a Partition of brick in this Cellar, which contains 105 feet, at one foot and a half thick. The Question is, how many feet is contained in this Brickwork being reduced to a brick and a half, and consequently how many square Rods therein?*

To reduce a Brickwall there are two ways.

I. You may say by the Line of Numbers, if 3 gives 4, (*viz.* 2 brick thick) what shall 406 *feet* give? *facit* 541 3 10hs at 1 brick and a half.

II. Say, If 3 (*viz.* the number of parts that a brick and a half is supposed to be divided into) is to 5, (*i. e.* the parts of 2 bricks and half:) so is 105 to 175, at 1 brick and half. The sum of these 2, together with the *Partition* 1 brick and a half thick, amounts unto 821. 3 10hs. and so many square *feet* are therein, being all reduced to 1 brick and a half; which divided by 272, (as is usual among Measurers, although 272 one fourth is the true square *foot* in a Rod of 16 *foot* and half in length) the *Quotient* is 3 Rod and a small matter more not considerable, *viz.* five 272 parts.

Otherwise reduce all these Walls into half a brick thick, *viz.* that of 406 *feet* at 2 bricks, will be

be 1624 *feet*, all half a brick thick, which is done by multiplying 406 by 4.

Again, 105 multiplied by 4 for 2 bricks thick, produces 225, reduced to half a brick. And lastly 105 multiplied by 3, the product is 315; all these added together amount to 2464 *feet*, (all being reduced to half a brick) which divided by triple 272, *viz.* 816, the *Quotient* is 3 Rod and somewhat more as before.

And according to either of these plain familiar ways, you may operate in reducing of a brick Wall of any thickness, and also compute the *feet* or Rod contained therein: or having first reduced the *content* of the several Walls into half a brick thick, and so obtained the *Product*, if you desire to know how many *feet* is contained therein at 1 brick and half, 'tis by dividing that *Product* by 3, thus: 2464 divided by 3 (the parts of 1 brick and half) the *Quotient* is 821 one third, *viz.* 821 and 3 10ths *&c.*

Further, note that having the superficial *content* of any Brickwork in *feet*, reduced to a brick and a half, and you desire to turn it into Rods without the help of *Division*, but rather by *Multiplication*; then multiply your number of *feet* given, by this number 3673, abating or cutting off (as a decimal part of a Rod) 8 figures towards your right hand, and you shall have the square Rods and parts exactly true, within less than 100 part of a Rod, a thing inconsiderable.

Example.

Example.

I have a piece of Brickwork which contains 6043950 square *feet*, at a brick and a half, how many Rods are contained therein? *facit* 222. as appears by the work of *Division*,

	Rod.
272|25) 6043950 (222	
54450	
59895	
54450	
54450	
00000	

But see how near *Multiplication* agrees

6043950
3673

18131850
42307650
36262700
81318501

221\|99428350

Thus you see what an inconsiderable difference is between *Multiplication* and *Division* in this particular.

And this number is found by dividing a *unite* with *cyphers* added at pleasure by 272,25 the *Quotient* is 00003673 *&c.*

Question III.

How many Bricks will make a square Rod of Brick-work, at one brick thick (viz.) the bricks length?

TO estimate this there are Tables already extant, some allowing 3000, others 2900 or thereabouts, to compleat a Rod of Brick-work at a brick thick.

But for their satisfaction that are but beginners in these matters, for whose sakes this Discourse was chiefly intended, I shall endeavor to point out a way that may nearly hit the mark.

First, let the ends of the bricks be considered *viz.* their breadth and thickness, but their length suppose to be the thickness of the Wall.

Secondly, Supposing 4 bricks in thickness with allowance for Mortar makes 1 *foot*.

Thirdly, let 2 bricks and about 3 quarters Mortar and all in breadth, (considered at the end) likewise make another *foot*, and this I judg is very near the matter.

Fourthly, Multiply the long *feet* in a Rod, *viz.* 16,5 by 4, that produces 66 bricks in thickness, to make 16 *foot* and half one way.

Fifthly, Multiply 16.5 by 2,75 or 2 bricks 3 quarters, and the Product is 45,38 *ferè*, that is,

45

45 bricks and about a quarter, laid breadth to breadth, mortar and all: Now having a Rectangle made of the number of bricks, in breadth and thickneſs, mortar and all conſidered, in long Rod, I multiply the one into the other, and that produces the number of bricks in a ſquare Rod at the aforeſaid thickneſs, *viz.* Multiply 45,375 by 66, the Product is 2994:75. And ſo many bricks will make a ſquare Rod of Brick-work: but conſidering the waſte that is made in the work, I may well allow with Mr. *Philips* 3000.

Queſtion IV.

I have agreed with a Labourer to dig a Cellar, whoſe breadth is 26 foot, the length 30, and depth 8 foot, at a certain rate by the Load, ſuppoſing 3 foot ſolid to contain a Load: the Queſtion *is, how many Load are contained therein?*

THis is very eaſily reſolved by *Multiplication* and *Diviſion* upon the Line thus:

Example.

I. Extend the Compaſſes from 1 to 16, the breadth, the ſame *extent* will reach from 30 the length, to 780, the ſuperficial *contents* of the piece of ground to be dug.

II. Extend the Compasses from 1 to 780, and that *extent* will reach from 8 the depth, to 6240 the solid inches in the Cellar.

III. To reduce them into solid yards, I extend the Compasses from 27 the cube *foot* in a yard, to 1, and that *extent* will reach the same way from 6240,231 and better; and so many Load therefore are contained in that Cellar.

Question V.

I. *There is a piece of Timber 3 foot long, 5 inches in breadth, and 7 inches in depth.*

II. *There is another piece 4 foot in length, 6 inches in breadth and 4 deep.*

III. *There is another piece 9 foot in length, 4 inches in breadth, and 6 inches deep.*

IV. *There is another 8 foot in length, 7 inches deep and 5 inches in breadth.*

The Question *is how many such several pieces, having of each sort alike quantity, there must be to make* 10 *Tun of Timber, at* 40 *foot to the Tun?*

See the Work:

1	2	3	4
12	12	12	12
3	4	9	8
36	48	108	96
5	6	4	5
180	288	432	480
7	4	6	7
1260	1152	2592	3360

Add all these Products together thus:

1260
1152
2592
3360

Total 8364

Having thus found the Cubick Content of the 4 several pieces of Timber in inches, and added them together; let the said sum be the Divisor, and 69, 200 (the Cube inches in 10 Tun of Timber) be the Dividend, and the Quotient will be $82\frac{216}{1152}$ viz. nearly 83 of a sort, the Answer to the Question.

Note that if you multiply 1728 the cube inches in a solid foot by 40, the feet in a Tun of Timber, the Product is 69120; which again multiplied by 10, by adding a cypher, produces the Number or Divident before mentioned.

Quest.

Queſt. VI.

If a Piece of Timber be 10 *foot long, and* 8 *Inches broad, and* 5 *inches deep, how many foot of Timber of* 8 *Inches ſquare will be therein?*

Anſw. 9 Foot and almoſt a half.

Queſt. VII.

If a piece of Timber 8 *foot long, and* 8 *inches broad at one end, and* 6 *inches at the other, and* 6 *inches deep at one end, and but* 4 *at the other, how many Foot of Square Timber is in ſuch a piece; 'twill be found* 1 *foot* $\frac{24}{100}$ viz. near 2 foot.

Queſt. VIII.

I have 6 *pieces of Timber, each of them* 10 *foot long, ſquaring* 6 *inches, I would exchange them for other pieces* 8 *foot long, ſquaring* 4 *inches, how*

how many muſt I have of that ſort?

Anſw. 17 Pieces almoſt, or 16 $\frac{144}{173}$.

Queſt. IX.

There is a piece of Timber 12 *foot long, ſquaring* 8 *inches, is to be converted into a round piece* 8 *inches Diameter, how many feet of Timber is in ſuch a piece?*

Anſw. 4 foot $\frac{1}{2}$ of a Foot.

Queſt. X.

There is a piece of Timber 8 *foot long,* 7 *inches broad, and* 5 *inches deep, how many ſuch pieces are in a Tun of Timber, being* 40. *foot in length,* 12 *inches broad, and* 12 *inches deep?*

Anſw. 20, and above a half, *viz.* $\frac{10}{17}$.

Queſt. XI.

There is a piece of round Timber 18 *foot in length, Tapering, and the Diameter in the middle* 31 *inches, how many foot of ſquare Timber is in the piece?*

Anſw. Almoſt 12, or 11 $\frac{1527}{1731}$

Queſt. XII.

There is a piece of Timber of 5 *equal ſides, each* 20 *inches, and the Semidiameter* 8 *inches, and the length of the piece* 12 *foot, how many foot of ſquare Timber is in that piece?*

Anſw. 16 $\frac{2}{10}$.

Queſt. XIII.

Suppoſe the Diameter of a Room be 18 *foot, how many foot of Board will floor the Room?*

Anſw. 254 $\frac{2}{11}$.

Note,

Note, that if you would find the *Area* of an *Ellipsis* or Oval Form, take both the Transverse and Conjugate Diameters; multiply one into the other, and extract the Square Root, and that shall be the Diameter of the Oval reduced to a Circle; by which you may find the *Area*, as is shewed by one of the former Problems.

Example.

Let the longest Diameter be 36 Inches, and the shortest Diameter 16, these multiplied one into the other, produces 576; the Square of the Diameter of a Circle 24 inches equal in *Area* to the Oval, and the *Area* will be 452 Inches, 4 Tenths *fere*, or 452 $\frac{4}{10}$.

Quest. XIV.

There is a May-pole 100 foot high, from which a piece is broken off, so that the Top thereof hangs down upon the ground 17 foot from the Body of the May-pole; the Question is, how much is broken off, and how much standing?

This is only to resolve a Plain Right Angled Triangle, having 2 sides given in one sum, and the

the other ſide apart, to find each of the other ſides given together,

For Reſolution of this Queſtion, ſquare the 2 ſides given together; ſquare the Baſe alſo, and ſubſtract the ſquare of the Baſe from the ſquare of the ſum of the ſides, and divide the Remainder by double the ſum of the ſides given, the *Quotient* is the Anſwer, *viz.* the quantity broken off, which ſubſtracted from the whole, the remainder is that part that remains ſtanding, and thus it will be found that 51 feet and $\frac{1}{2}$ almoſt is broke off, and 48 & $\frac{2}{3}$ & better is left ſtanding.

Queſt. XV.

Three Carpenters, A B C, *bought a Grindſtone, whoſe Diameter was* 42 *inches, for* 30 *ſhil. viz.* A *paid* 15 *s.* B *paid* 10 *s.* C *paid* 5 *s; The Queſtion is, how much each man muſt grind down? ſuppoſing* A *to be ſerved firſt,* B *ſecond, and* C *laſt of all.*

To work this Queſtion, firſt find the *Area* of the whole Circle, then divide the *Area* according to the proportion of each mans Mony; having ſo divided the *Area* into their ſeveral parts, find the *Diameters* of each of thoſe Circles

cles agreeable to their ſeveral *Area's*; Laſtly, Subduct the Diameter that appertains to A, out of the whole *Diameter*, and $\frac{1}{3}$ the Remainder is the inches and parts to be ground down for his ſhare. Again, ſubſtract the *Diameter* appertaining to the leaſt mans ſhare, C, out of the *Diameter* appertaining to A, the firſt man, and $\frac{1}{3}$ the Remainder will be the inches and parts that B the ſecond man muſt grind down. And laſtly, $\frac{1}{3}$ the *Diameter* appertaining to C, the laſt mans ſhare is the quantity of inches and parts left remaining next the Spindle for his ſhare; and hence you will find (that pleaſe to try) the whole *Area* 1386 Inches.

The *Area's* belonging	unto	A	693	Diameter	12, 30.
		B	462		12, 56.
		C	231		17, 14.
Their Total					42. 40.
Equal to the whole,			1386.		

The Halfes of which *Diameters*, *viz.* 6 inches, 15 parts for A, 6, 28 for B, and 8, 57 for C, are the true quantities that every man ought to grind down proportionable to the ſeveral ſums of Money they paid.

Queſt.

Queſt. XVI.

Admit I have an Irregular diſordered ſmall Solid to be meaſured, what is the way and manner of meaſuring thereof?

To meaſure ſuch kind of Solids, the beſt way to perform it, is, by the help of Water, in a prepared Veſſel, thus; *viz.*

Firſt, Prepare a Veſſel exactly Cubical, ſo large that it may contain the ſaid Irregular body therein; having ſo done, put it into the prepared Cubical Veſſel, and poure in ſo much water as may juſt cover the ſame, and make a mark where the ſuperficies of the water touches your Veſſel.

Having ſo done, take out the ſame Irregular Body, and make a ſecond mark where the upper ſuperficies of your water cuts the ſide of your Veſſel; then by your Rule meaſure the diſtance of theſe two Marks in inches and parts, which you are to multiply by the ſquare of the ſide of your prepared Veſſel, and that product ſhall be the ſolidity of your Irregular Body deſired.

Example.

Example.

Admit my hollow Veſſel made in an exact Cubical form, the inward ſides thereof be 20 inches, then puting in my irregular ſmall Solid (let it be of what diſordered form you can imagine) I continue pouring water till it be compleatly covered, and there I make a mark, then taking out the Body again, I obſerve how much the water is ſunk, which ſuppoſe to be 7 inches, which I multiply by the ſquare of the ſide 20, *viz.* 400 and that produces 2800 cube inches, and ſo many inches therefore are contained in the ſaid Solid. Many other Varieties of this kind of Meaſuring might be inſerted, and their application, which is of ſingular uſe in the performance of many ſtrange Concluſions thereby, but I ſhall only preſent you with one more, as a taſt, and ſo conclude at this time, till a farther opportunity is offered.

Queſt. XVII.

Admit I have a Solid whoſe weight is given, but I deſire the weight of a certain portion or fragment thereof, without ſeparating or cutting it off from the whole.

To

To perform which, Having the weight of the whole 100 pound, I proceed after this manner; I put the whole Body (let it be a pillar of Brass or Iron, *&c.*) into my aforesaid prepared Vessel, and fill it full of water, then I gently lift it up till all be out of the water, save that portion I desire the weight of, and then I note how much the superficies of the water is fallen; and lastly, I take it all out of the water, and again note how much more the water is sunk upon the inside of the Vessel, *&c.* Now suppose at the first lifting up of the Solid, the water falls from the top 12 inches, and at the second, 8 inches more from that; which from the top is 20 inches, I multiply 8 by 100, the whole weight produces 800, which divided by 20 inches, the greater distance from the top to the lowest mark, and the *Quotient* is 40, and so many pound weight is the portion or fragment thereof; but here you are to suppose the whole Body of one and the same substance, not mixt; if it be a mixt body, 'twill require a more curious Calculation: and by this means *Archimedes* found the exact quantity of every Metal in the Crown without breaking it in pieces.

FINIS.

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